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## PRESIDENTIAL ADDRESS\*

### Our Heritage and Our Stewardship

A. D. CAMPBELL, M.D., MONTREAL, QUEBEC

THE great honor you have bestowed on me brings with it a sense of pride, which I can assure you is shared by my Canadian colleagues.

The recent catastrophe which has engulfed the world has amply shown how community spirit and common interests can dispel any chauvinism that might otherwise be so easily fostered on either side of the invisible line which divides (but does not separate) us as neighbors. Since our two countries derive their traditions from the same stem, it is but natural that they should have much in common. While our political and social views on this side of the Atlantic are somewhat different from those of the parent stock from which we grew, yet our perspective, our ideals, and ethics are identical. In medicine, all English-speaking countries have a common heritage of which they are, or should be, justly proud.

The gavel, symbolizing as it does so much of the tradition of our Association, is fashioned, as you know, from the home of Ephraim McDowell, who, by his epoch-making operation on Jane Crawford, became our Patron Saint. In a relatively short space of time it has witnessed changes more startling and more far-reaching than did the "Gold-headed Cane" during the centuries in which it represented the best in the medical profession in England.

As one holds this symbol, one is stirred to the depths by vivid recollections of so many eminent men. It seems that their eyes are upon us, and that hidden in the shadow of the wings, silently disapproving or applauding, they still direct

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or even prompt those on our stage. Many of them so famous, many now unhappily forgotten, they are, and I hope always shall be, an inspiration to us.

Our professional ancestors down through the centuries have labored long and lovingly to spin the warp and woof of the tapestry upon which we now record the present-day conception of our ancient discipline.

Throughout history, men of scientific vision have rebelled against the dogmatic learning of their time. Their individuality, independence, and originality were less appreciated by their contemporaries than by posterity which they enriched. Their ideals have more or less determined our course and furnished us with relative values by which we should be able to appreciate our opportunities. Even in our time we have known great men whose accomplishments have revealed their inestimable value to mankind. Unfortunately, we are living too close to these achievements to comprehend fully the magnitude of their endeavors. Let us consider it a divine privilege to have been "matched with this hour," to have read original articles written by these men; to have heard their voices from the platform; to have exchanged greetings with them.

It would be unfair not to remember, along with these outstanding figures, the names of the great many who came close to their goal, but, because of circumstances, failed to gain the last step to find the one vital link. Had Lady Luck lent her assistance, or merely smiled upon their efforts, many now forgotten would doubtless rank among the immortals.

Though much of early medicine seems now to be irrelevant, reference to certain historical pioneers should sharpen our interest and provide a living inspiration. The environments and circumstances in which these men were born and worked serve to emphasize the boundless scope for progress afforded us by the present. It would seem ungrateful and ungenerous on our part if we were to allow the incredible advances made during recent years in our profession to blind us to the debt we owe to our predecessors, from whom we have inherited a goodly store of our scientific possessions. Further, it is our responsibility to impart this princely legacy to the present generation and to transmit it to posterity intact—nay, even augmented.

Has not the present position of medicine been the result of a certain series of achievements frustrated by misinterpretations of contemporary thought, but with it all, gradually shaping towards a form of which we are experiencing a mere glimpse? If medicine were articulate, it would justly say as did Tennyson's Ulysses:

I am a part of all that I have met;  
Yet all experience is an arch wherethro'  
Gleams that untravell'd world whose margins fade  
Forever and forever when I move.

Professor Edward Dunster in addressing the New York Academy of Medicine in 1872 observed: "Progress, in any field, parallels the mental inclination and degree of learning of civilization. Our accumulated knowledge gives us a vantage point from which to look back, analyse the past, and reveal its errors." We should be mindful of our successors, for, in their turn, they will undoubtedly recognize in our concepts certain absurdities as we do now so clearly discern those in our ancestors.

Somewhat like the life of nations, medicine has had its periods in which it produced brilliant philosophical and scientific men who practised with sincerity and extraordinary ardor. Such times have, unfortunately, been followed by periods of relative hibernation.

While a study of the cycles of advance and recession is interesting, their fluctuations are difficult to explain. It would seem, however, that universal upheavals tend to reanimate the dormant and awaken the more curious to research, with the result that literature and science have thus often been enriched. Paradoxical as it may appear—the greater the carnage, the more outstanding the advance. The discovery of insulin followed close in the wake of World War I, while World War II gave impetus to an embryonic scientific observation that glorified the humble mold.

Of all the impediments to progress in the past, the blind or slavish adherence to authority and custom has been the greatest. Credulity and superstition have been the means of upholding and spreading error. But this is largely dependent upon "the conditions of the time, the prevailing education, and the degree to which customs, traditions, superstitions, and metaphysical systems were ingrained."

It must not be thought that such adherence is limited to the ignorant and uneducated, for as Sir Thomas Browne (himself reputed to be a believer in witchcraft, though not in alchemy and astrology) observed: "Credulity, though a weakness of the intellect and more discoverable in vulgar heads, yet hath it sometimes fallen upon wiser brains and great advancers of truth."

In order that new thought may be adopted by the masses, it must first be preceded by a general enlightenment such as may prepare the soil to cherish and foster the acorn which at its maturity will, it is hoped, overshadow and blight the scrubby and useless undergrowth of conventional or time-honored practices.

The old may continue, but, like the new, must stand the test of truth, as only the rational eventually dominates.

It would be an interesting theme to recount the developments in the many aspects of the treatment of puerperal infection since 1773. It was in this year that Charles White of Manchester formulated the present-day conception of asepsis in the prevention of puerperal fever and outlined the care of those so stricken. It would appear that the discoveries of Pasteur and Lister were required to dislodge the ingrained conception that childbed fever was unavoidable or purely the unfriendly act of God. Though the indomitable Lawson Tait held opinions contrary to Pasteur and Lister, nevertheless, these prepared the way for his adoption of the principles of housewifely soap and plenty of hot water, enunciated by White. William Mayo expressed the opinion of modern surgery when he stated: "The cavities of the body were a sealed book until the father of abdominal surgery, Lawson Tait, and our own Joseph Price, carried the sense of sight into the abdominal cavity."

It is not my intention to epitomize chronologically medical history, but rather to comment upon certain characteristics of a few men who have directly

or even indirectly contributed to its existing pattern. Their ideals, their personalities, and, it would seem in some instances, their very faces belong to our history.

Hippocrates clearly saw that the accumulation over the centuries of legends, theories, fancies, and mysticism upon which ancient medicine was based was untenable. He therefore conceived a more logical philosophy and one which appealed to reason. Characteristically a Greek, he was an observer and logician rather than a scientific investigator. He emphasized the rules and regulations regarding cleanliness and set forth certain requirements for the physician's appearance, state of health and attire, as well as those for his conduct.

As the civilization of Greece declined, so did the doctrine and teachings of the Father of Medicine become dissipated. Rome, however, gained ascendancy and with this upsurge, Galen, admittedly a master physiologist and a convincing teacher, was to assume in the new Empire the mantle of Hippocrates. It is true that his ideas were in certain respects at variance with those of Hippocrates, for this approach was entirely different, but the fact that he himself was a Greek and that he referred to the more ancient Greek medicine, kept the embers of the earlier philosophy from being smothered to extinction beneath the intellectually dank atmosphere of the Dark Ages.

Physicians of learning throughout the centuries have recounted the achievements of their predecessors. Linacre revived the teachings of Greek medicine. As Osler remarked—"He brought Harvey back to Galen and Sydenham back to Hippocrates." Similarly, Francis Adams and Littré in the nineteenth century, translating the works of Hippocrates, revived an interest in the ancients. The same is certainly true of our revered Sir William Osler, physician, scholar, and humanist, who not only studied his ancient favorites with loving appreciation, but also accumulated a priceless library in which a student may discover the whole history of the medical discipline and may gaze with awe at precious first editions of many of the classics of the profession.

The intellectual tyranny exercised by the Ancients, the Church, and by the religious sects and orders in medieval days, is from our point of view almost beyond belief. Midwifery was licensed only by the Church. Few, even though relatively enlightened, could display such independence as to defy this tyranny or to dissipate the aura which hovered around the very name of Galen or the Church. Fortunately, however, there were those who put into practice the method of observation and induction advanced by Francis Bacon, whom Abraham Cowley, himself a physician, eulogized—"Bacon, like Moses, led us forth at last."

Harvey, in his rebellion against religious thought, gave evidence of his reckless courage. To quote his own words he "felt in some sort criminal to call in question doctrines which had descended through a long succession of ages and carried the authority of the Ancients; but he appealed unto Nature, that bowed to no Antiquity, and a still higher authority than the Ancients." Harvey, though usually remembered as an experimental physiologist, extended his studies to embryology, medicine, surgery, gynecology, and midwifery. In this later

connection, it is noteworthy that the first original work in midwifery, published in England in 1653, was written by him.

The temperament and behavior of von Hohenheim (Paracelsus) was probably a reaction against irreconcilable opposition and frustration by the suave academicians and bombastic arrogant clinicians of his time. His ruthless attitude seems to have been necessary in attracting attention to himself in a hitherto self-sufficient world which was now being awakened by the dawn of the Renaissance. His independence and originality were further demonstrated, when he insisted on lecturing and writing in the vernacular. Some 200 years elapsed before Dr. Cullen, one of Dr. William Hunter's teachers, similarly deviated from custom by delivering his lectures in English.

Of an opposite disposition was Andreas Vesalius, born in Brussels, keen and scientific by temperament, taciturn of manner, and verging on the melancholie, he made his appearance in Padua to force a breach in the ramparts of accepted medical thought. Had he not been born into a family with medical tradition, he might have been found within the high walls of some remote monastery, a pious monk rather than a pioneer in medical science. In Vesalius was born a passion and a talent for dissection which he regarded as an art and so meticulously performed. Deep in his thoughts, at the risk of his life, he was wont to stroll through the cemeteries or even wait patiently by the executioner's gibbet for an opportunity to seize a body for his beloved purpose. Science lost a pioneer and one of its greatest investigators when, at the age of 29 years, too harassed by his critics and jealous contemporaries, he voluntarily and abruptly discontinued medicine.

Percival Willoughby, a conservative, practical, and modest obstetrician, represented his period. He scorned secrecy and depreciated the erotchet and many of the then current practices of midwifery. Since he felt that he had very little to offer to replace existing customs, his publications were few. Fortunately, however, his notes were preserved and published posthumously, which furnishes us with the most authentic and valuable document on midwifery in the seventeenth century.

Perhaps few realize that clinical instruction, as we know it, dates from Archibald Pitcairne, born in Edinburgh in 1652. Much neglected in history, he was a rare Scotsman of strong character, a poet, a mathematician, and a scholar. For some time a professor in Leyden, he returned to his own city to lay the foundation of bedside teaching as we know it. Like Sydenham, he insisted on strictly scientific methods. Further, like Sydenham, he conceived that Nature lies concealed and that the more sought after, the further she recedes. Among his professional offspring were such eminent physicians as Richard Mead and Boerhaave of Leyden. From his school in Edinburgh came the men who founded McGill University, Laval (now the University of Montreal), and the University of Pennsylvania.

An earlier hero, Ambroise Parè, was a notable example of versatility and resourcefulness. On more than one occasion he performed the different offices of physician, apothecary, surgeon, and cook. On returning from the German

Campaign in 1552, at the Siege of Danvilliers, Parè amputated an officer's leg by his newly devised method, using the ligature instead of hot irons to check hemorrhage—"I dressed him, God healed him." Following this experience, he extended the use of the ligature to arrest hemorrhage in circumstances other than amputation. Only after some twelve years of experience with ligatures did he advise his readers to forgo completely the use of cautery. Curiously enough in 1557, Parè, observing swarms of blowflies on the battlefield, remarked—"I think they were enough to cause the plague where they settled." Was this not the first reference to flies as conveyors of infection?

Everyone knows of the experimental work of that greatest of physiologists, an American, William Beaumont. It was of him that Osler said—"His work remains a model of patient, persevering investigation, experiment and research, and the highest praise we can give him is to say that he lived up to and fulfilled the ideals with which he set out, and which he expressed when he said: 'Truth, like beauty, is 'when unadorned, adorned the most' and, in prosecuting these experiments and inquiries, I believe I have been guided by its light.'" This army physician, stationed on the unfriendly shores of Lake Superior following the War of 1812, though equipped with no special training or technical apparatus, but animated by the spirit of inquiry, seized the opportunity of observing the functions of the stomach in the case of Alexis St. Martin whose abdomen was torn open by gunshot. The recorded observations of this natural physiologist were published, read, and forgotten while academicians still theorized. His observations were later used as a springboard for those engaging in investigations of the functions of the stomach.

Similarly, had not Mrs. Merrill been tossed from her horse, Marion Sims might never have made his monumental contribution to the repair of vesico-vaginal fistula.

In like manner, we should, as gynecologists, pay tribute to one Henry Krohn for his keen inquiring mind. We would be well advised to copy the example of Dr. Krohn, similarly recording our observations of various phenomena which as yet have not been clearly explained. Though a relatively obscure London practitioner, he maintained that all unusual phenomena should be published for the edification of fellow practitioners. In 1791, he observed a curious phenomenon in a woman with child. From his description of the patient and his clinical findings, one would at once surmise an abdominal pregnancy. A postmortem was performed and his diagnosis confirmed. His general deductions are interesting, and his queries have not as yet been answered.

The quiet Scottish lad, John Hunter, direct from the cabinet maker's shop, came as a mechanic to his brother, William, then enjoying a selected practice in London. John, who educated himself, became the greatest of clinicians, of surgeons, and of teachers. He studied various physiological phenomena in mammals, birds, and bees; he dissected and mounted thousands of comparative as well as human anatomic specimens for the benefit of those who followed. His anatomic work was the basis of the museum of the Royal College of Surgeons which, alas, was destroyed by a German raid in the recent world war. Hunter was ever cautious of confounding fact and hypothesis. To quote his biographer

—"He had never read Bacon, but his mode of studying Nature was as strictly Baconian as if he had." Though a prodigious worker, he found time for the company of such friends as Joshua Reynolds, Sam Johnson, and David Garrick. John Hunter serves as an example of achievement through industry, imagination and deductive reasoning.

It may not be inappropriate here to recount a statement which Hunter is said to have made: "My motive was in the first place to serve the hospital, and in the second to diffuse the knowledge of my art, that all might be partakers of it; this, indeed, is the highest office in which a surgeon can be employed; for when considered as a man qualified only to dress a sore or perform a common operation, and perhaps not all of those that may be considered common, he cannot be esteemed an ornament to his profession."

Jenner was one of those who realized the importance of "the courage of patience." His observations extended over a decade before he was sufficiently convinced to publish his conclusions. It is particularly worthy of note that though his country was at war with Napoleon, Jenner demonstrated his chivalrous and humanitarian nature by sending Woodville, his assistant, to Paris to control the epidemic of smallpox. Many of you will no doubt recall the simple inscription on the monument which stands on a hillside at Boulogne: "Edward Jenner-La France Reconnaissante." We can say with confidence of Jenner and Hunter as did W. W. Keen say of Lister: "His name belongs to no age and no country, but to humanity."

We are particularly interested in Hunterian times, for Morgan, Shippen, Physick, and Rush were the ambassadors who transplanted the ideas of this era to America.

As events recede, it is difficult to estimate the influence upon physicians of contemporary associates other than those directly immersed in their own field. From time to time, by interchanges between professions, many new scientific ideas have undoubtedly been introduced into medical philosophy.

The catholicity of interest displayed by Hunter is exemplified at an earlier date by Sir Christopher Wren, the architect of St. Paul's Cathedral, who knew something of physiology. He illustrated the findings of Willis, and endeavored to devise a means of recording blood pressure. He was probably the pioneer in transferring blood from one individual to another.

Many of those who assisted in the building of medicine did so through their contribution to the general development and spread of knowledge. We are proud of these men, "travants of medicine" as Lord Moynihan described them, who forsook their original calling to become disciples of science, literature, law, art, and government. While medicine owes much to the humanities, many there were also who attained the highest rank in the "republic of letters," who owe their understanding of nature and philosophy of life to their early training in physie. In this connection we recall the names of Schiller, Rabelais, Goldsmith, Keats. On this side of the water the immortals, Oliver Wendell Holmes, Sir William Osler, and his disciple, John McRae, throughout their lives claimed a dual interest in literature as well as in their chosen profession of medicine.

We should not permit ourselves to be engulfed in the tides of current ideas. Rudolf Virchow, the father of modern pathology, stoutly maintained that it was mischievous to teach hypothesis which still remained in a speculative stage. Many there are who seize upon the most recent laboratory findings and at once adopt a form of treatment based on their particular interpretation of unproved statements. These "drop the bone for the shadow." Our task as clinicians should be the study of life and human nature, that we may better understand how to apply advances in order to accomplish our common aim of relieving pain and discomfort and of postponing death.

It is regrettable that over the years there should be such an accumulation of medical literature of which a considerable portion is of relatively little importance, much of it tending to increase misunderstanding or add confusion. We must remember that such writings are not like smoke letters in the sky, but are ineradicable and indelible. As Horace observed: "You may destroy what you have not published; but the word once uttered cannot be recalled." What is written is as lasting as civilization, exposed to the endorsement or questioning of generations to come, by which we will be judged as individuals or an era. Let us look well to the pen!

James B. Conant, in addressing the Graduating Class of 1945, McGill University, made it clear—"To be able to add to knowledge the investigator must first be familiar with what is known. Few men have the temperament and the mental qualities which research demands. Research is the intellectual labor of original thinkers and learned men." Is it not inevitable that in former times isolated individuals only had the courage to bring medical teachings and customs under question? Today, every specialist, practitioner, and even the student, regards it as his right and privilege to question the sequence of reasoning in order to understand more clearly the logic of statements. It is, therefore, the lack of proof which stimulates research.

In our teaching, the basic aim of medicine in all universities conforms to a similar pattern with no intention of curbing natural mental endowments. Encouragement is given to those with ability that they may add further to their talents and that their efforts may be rewarded by advancement in some selected sphere. On the other hand, premature concentration on a fancied aspect of medicine should not be encouraged to the detriment of a well-balanced and thorough understanding of basic and essential facts.

Fundamental principles alone are the permanent landmarks of physie. If one is to be a general practitioner, and which of us would forfeit that privilege, he must realize that highly specialized courses, which of necessity are modified from time to time, definitely overshadow the simpler aspects upon which the art of diagnosis and the science of treatment are based. Dr. Rudolph Matas, in his appreciation of William Stewart Halsted, observed: "Nothing so cultivates the noblest human qualities, nothing exalts more the sense of pity, sympathy, and charity than does an intimate knowledge of the causes and consequences of the processes of disease, nothing more stimulates tenderness than the constant contact with suffering and distress."

The work done at the bedside is the foundation of medicine, as it is also the measure of its success. To quote Thomas Sydenham: "Go to the bedside, for it is there you will learn to know disease." Medicine stands or falls by its clinical practice assisted by every means that modern science affords.

Present-day conveniences and means of travel have brought the laboratory within the reach of the most remote practitioner who, while not necessarily a specialist in laboratory procedures, should be able to interpret the practical aspects of scientific findings. The public is now taught and demands a change from a generation ago when a doctor might, in the language of Oliver Wendell Holmes: "Skip upstairs, inquire, inspect and touch, prescribe, take leave, and off to twenty such."

The education and training of those embarking upon the practice of medicine should not be restricted to a relatively narrow channel, but should extend into the fields of the humanities, of natural sciences, philosophy, and so-called public relations. The physician and the public are partners, dependent upon each other for the understanding and betterment of social conditions. Without this mutual understanding there is the ever present danger that the rapid progress of political and social movements may destroy traditions upon which are built the foundations of medicine.

Projected upon the screen of current history one sees the figures, as yet poorly outlined, portending a vast change in our social customs and education to which our practice and ideals must conform. It is true that "the alloy of civilization" differs with each age, but the present change has hurtled down upon us when we are not prepared. Principal James of McGill University, in addressing the Class of 1944, remarked: "We must develop an education pattern which, in terms of twentieth century society, aims at the Greek ideal of a rounded personality, a man equally able to enjoy his own life and to contribute to the welfare of the community in which he lives."

It is apparent in a panoramic survey of the lives of the men who have created our heritage that the present position of medicine in our social structure has, through the centuries and by diverse means, been hard won by men of reason, by men of courage, by men of ingenuity, by men of imagination, by men of industry, by men of integrity, and by men of patience. They too were inspired with a sincerity of purpose, a spirit of benevolence, and an unselfish interest in the welfare of their fellow men, possessing a faith in posterity, a faith characteristic of the truly great.

In the cosmopolitan graveyard of the ages are the scattered cairns of a vast cavalcade of those whom we should revere as our professional ancestors. On some of these cairns, the names and epitaphs are marked; on others, the names but not the deeds are visible; on yet a third group, an achievement is still discernible, but the names have, with time, disappeared. In other places mere mounds bear mute testimony of the resting place of those whom we should be proud to claim as of our guild. "What mean ye by these stones?" The nameless headstones cover those who, in a less conspicuous but none the less disinterested way, served humanity according to their lights. Not a few of this last group were humble practitioners. True it is that certain of them have been

glorified in song and in story, but the vast majority simply dropped the torch, bright or barely smouldering, for the chance successor, while they themselves, exhausted, silently stumbled into the darkness. Their work went unnoticed; in Sir Thomas Browne's beautiful phrase: "The iniquity of oblivion blindly scattered her poppies," and of their lives of devotion, of constructive thought and sincere endeavor, no memorial remains. It is but right and proper that these simple graves, showing here and there throughout time's boundless cemetery, should be placed hard by those which record achievements widely acclaimed and preserved for posterity. Their deeds shall outlast time. The stoic philosopher came near to the truth when he exclaimed, "Man's true God is the helping of mankind."

These are they who by compounding the best that is in tradition have established the prestige which we now enjoy. Let me hasten to add, however, that prestige is not permanent but withers or dies without continued and earnest endeavor.

We are but the temporary custodians of our great heritage, and if we, and those who follow us, are to retain "a place in the sun" we must cling to the creed of the builders, a creed similar to that suggested by John Ruskin: "When we build, let it be such a work as our descendants will thank us for; and let us think, as we lay stone on stone, that a time is to come when these stones will be held sacred because our hands have touched them, and that men will say as they look upon them, 'See! this our fathers did for us.' "

Even so may it be with any one of us, for what service may lie within our power to perform, we know not. The achievement none can promise for himself, but we can be sure of the aim; and Mordecai's words to Esther may point the destiny of the humblest among us: "Who knoweth whether thou art come to the kingdom for such a time as this?"

1414 DRUMMOND STREET.

## OBSERVATIONS ON THIRTEEN CASES OF LATE EXTRAUTERINE PREGNANCY

H. HUYNH WARE, JR., M.D., RICHMOND, VA.

**E**XTRAUTERINE pregnancy of more than twenty-eight weeks' duration is not rare, but the number of cases occurring in any one clinic within a period of a few years is generally limited. Thirteen such cases, eleven of which were operated upon by the author, were observed on the wards of the Medical College of Virginia Hospitals during a seventeen-year period (1930-1946). Eight of these cases were reported previously.

Two hundred forty cases of full-term extrauterine pregnancies with living fetuses reported from 1813 to 1907, and 61 additional cases from 1907 to 1923 were reviewed by Bland (1939). He also reported twenty other cases after 1923.

Cornell and Lash, in 1933, presented an excellent comprehensive analysis of 226 collected cases of abdominal pregnancy published from 1919 to 1932 and ten additional cases reported for the first time. The maternal mortality rate in the 236 cases was 14.3 per cent. This included cases of early ectopic pregnancy in which the mortality rate is lower than in late abdominal pregnancies.

Hellman and Simon (1935) in a paper on "Full Term Intra-Abdominal Pregnancy," reported five cases and reviewed 311 other cases reported in the literature between 1809 and 1933. Cases reported after 1906 were included in the series only if the pregnancy was of twenty-eight or more weeks' duration.

A review of "Abdominal Pregnancy" was published by Beacham and Beacham (1946) with a report of twenty cases treated at the Charity Hospital of Louisiana during an eight-year period ending June 30, 1945. In this report there were nine cases of pregnancy of eight to nine months' duration.

The frequency of late extrauterine pregnancy is impossible to estimate. While several reviews cover about one and one-fourth centuries, there is necessarily much duplication between them, and none are related to any total of cases.

The author has charted 249 cases of extrauterine pregnancy of more than seven months' duration reported in the literature since the review of Hellman and Simon in 1935 (Table I).

In this series thirty-seven mothers died, a mortality of 14.85 per cent; eleven of these mothers left living babies. Of 251 babies, including two sets of twins, only 60 lived (24 per cent); 140 were stillborn, and fifty died within a few hours or days, a total mortality of 75.6 per cent. Three of the twins were stillborn, and one died soon after birth. One hundred and fifty-two babies were born at term, twenty-three were over term, and seventy-six premature. One fetus was carried for nine years (reported by Umnova, 1934); one for six years (reported by Denoon, 1944); and one for twenty-six years (reported by Mathieu, 1939). These mothers delivered living children in the interim. One ten-month

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TABLE I. CASES OF EXTRAUTERINE PREGNANCY (28 OR MORE WEEKS' GESTATION) REPORTED BY VARIOUS AUTHORS (1933 TO 1947)

AUTHOR	RE- PORTED	DURATION OF PREGNANCY	STATUS OF FETUS	WEIGHT (GM.)	RESULT		REFERENCE
					MOTHER	BABY	
1. Allen, E.	1933	Full term	Living; died in 8 hours	1,927	Lived	Died	AM. J. OBST. & GYNEC. 25: 753-754, 1933.
2. Borngen, H.	1933	7 to 8 months	Dead		Lived	Stillborn	Zentralbl. f. Gynäk. 57: 2968-2971, 1933.
3. Chanina-Gaiduk, F.	1933	Full term	Living	3,000	Lived	Lived	Monatschr. f. Geburtsh. u. Gynäk. 94: 22-28, 1933.
4. Clemente, G.	1933	8 months	Asphyxiated	2,300	Lived	Died	Ann. di ostet. e ginec. 55: 1479-1493, 1933.
5. Fernandes, M.	1933	Full term	Macerated		Died	Stillborn	Arg. de cir. e ortop. 1: 170-178, 1933.
6. Fernandes, M.	1933	Full term	Recently dead		Lived	Stillborn	Arg. de cir. e ortop. 1: 170-178, 1933.
7. Hayes, W. I.	1933	Full term	Lived 24 hours	2,948	Lived	Died	M. J. Australia 2: 17-18, 1933.
8. Mundell, J. J.	1933	Full term	Lived 3 hours; slightly deformed	3,288	Died	Died	M. Ann. District of Columbia 2: 86-90, 1933.
9. Scipiades, E.	1933	Full term	Living; normal		Lived	Lived	Arch. f. Gynäk. 156: 217-221, 1933.
10. Spackman, W. C.	1933	Full term	Lived 20 minutes		Lived	Died	J. Obst. & Gynaec. Brit. Emp. 40: 1220-1223, 1933.
11. Spackman, W. C.	1933	Full term	Slightly macerated, fully formed	2,494	Died in 5 days	Stillborn	J. Obst. & Gynaec. Brit. Emp. 40: 1220-1223, 1933.
12. Taylor, A. B.	1933	Full-term ruptured tubal pregnancy	Living		Lived	Lived	South African M. J. 7: 437, 1933.
13. Bronaugh, W.	1934	2 weeks over term	Died following recent rupture of sac		Lived	Stillborn	Ohio State M. J. 30: 823-824, 1934.
14. Colvin, E. D.	1934	7 months	Extremely macerated	28 cm. long	Lived	Stillborn	AM. J. OBST. & GYNEC. 27: 421-428, 1934.
15. Cornell, E. L., and Lash, A. F.	1934	8 months	Living	1,940	Lived	Lived	Illinois M. J. 65: 462-466, 1934.
16. Cornell, E. L., and Lash, A. F.	1934	Full term	Lived 18 hours	3,288	Died	Died	Illinois M. J. 65: 462-466, 1934.
17. Cornell, E. L., and Lash, A. F.	1934	Full term	Living	2,381	Lived	Lived	Illinois M. J. 65: 462-466, 1934.
18. Cornell, E. L., and Lash, A. F.	1934	Full term	Living	2,551	Lived	Lived	Illinois M. J. 65: 462-466, 1934.

LATE EXTRAUTERINE PREGNANCY

			Full term, tubal rupt-	Living	2,267	Lived	Indian M. Gaz. 69: 61-65, 1934.
19. Cruickshank, M. M., and Achar, S. T.	1934	1934	Over term	Died 2 weeks be- fore delivery; well developed	3,150	Lived	Stillborn
20. Dueuing	1934	1934	8 months	Lived 9 hours	2,608	Lived	Bull. Soc. d'obst. et de gynec. 23: 106-112, 1934.
21. Hosking, A.	1934	1934	Full term	Macerated	4,139	Lived	Brit. M. J. 2: 111-113, 1934.
22. Hull, E. T.	1934						AM. J. OBST. & GYNEC. 28: 452- 454, 1934.
23. Israel, A., and Jabre, E.	1934	1934	Full term	Dead for 1 month		Lived	Am. Fac. frang. de med. et de pharm. de Beyrouth 3: 119-121, 1934.
24. Low, E. B., and McCurrich, H. J.	1934	1934	Full term	Macerated, de- formed	3,061	Lived	Stillborn
25. MacGregor, I. G.	1934	1934	Full term	Twins; 1 small; macerated; other lived 12 hours		Died	1 died 1 stillborn
26. Margetson, N. J. L., and Ogilvie, D. C.	1934	1934	8 months	Dead		Lived	Stillborn
27. Powell	1394	1934	Full term	Living	3,855	Died in 10 hours	Stillborn
28. Remzy	1934	1934	7 months	Macerated		Lived	J. Kansas M. Soc. 35: 99-102, 1934.
29. Roxas Villarama	1934	1934	7 months	Lived		Lived	Gynec. & Obst. 9: 440, 1924. J. Philippine Islands M. A. 4: 50, 1924.
30. Scrimgeour, H.	1934		Full term;	Macerated	2,778	Died in 1 day	Stillborn
			vaginal de- livery; in- traliga- mentary				Malayan M. J. 9: 174, 1934.
31. Steel, W. A.	1934	1934	Full term	Living 12 hours Dead; 6 months, development	3,033	Lived	Died Stillborn
32. Umnova	1934	1934	9 years				Cited by Bland, et al., 1934.
33. Arndt, E.	1935	1935	12 months	Dead, macerated	1,400	Lived	Stillborn
34. Arndt, E.	1935	1935	13 months	Dead, macerated	2,550	Lived	Gynecologie 34: 481-488, 1935.
35. Arndt, E.	1935	1935	Full term	Well developed, lived 1 day	2,600	Died	Gynecologie 34: 481-488, 1935.
36. Arndt, E.	1935	1935	Full term	Living	3,000	Died	Gynecologie 34: 481-488, 1935.
37. Boogart, H. S.	1935	1935	Full term	Lived 1 day	4,300	Died	Nederl. tijdschr. v. geneesk. 78: 5223-5231, 1935.

TABLE I—CONT'D

AUTHOR	RE- PORTEO	DURATION OF PREGNANCY	STATUS OF FETUS	WEIGHT (GM.)	RESULT		REFERENCE
					MOTHER	BABY	
38. Boogart, H. S.	1935	Full term	Dead	Lived	Stillborn	Nederl. tijdschr. v. geneesk. <b>79</b> : 5223-5231, 1935.	
39. Boogart, H. S.	1935	Full term	Dead	Lived	Stillborn	Nederl. tijdschr. v. geneesk. <b>79</b> : 5223-5231, 1935.	
40. Cernoerje, M. U.	1935	Full term	Dead	Lived	Stillborn	Bratisl. lekar. histy. <b>15</b> : 176, 1935.	
41. Daners, H.	1935	17 days over term	Dead	3,700 days	Died in 19 days	Zentralbl. f. Gynäk. <b>59</b> : 212-218, 1935.	
42. Eisaman, J. R., and Ziegler, E.	1935	Full term	Living	3,232	Lived	J. A. M. A. <b>104</b> : 2175-2176, 1935.	
43. Ferguson, J. A., and Otis, I. S.	1935	12 months	Well-developed twins, dead	1,730 1,400	Lived	AM. J. OBST. & GYNEC. <b>30</b> : 139- 141, 1935.	
44. Hellman, A. M., and Simon, H. J.	1935	Full term	Living, normal	3,855	Lived	Am. J. Surg. <b>29</b> : 403-413, 1935.	
45. James, J. E., Jr. and Lafferty, H. D.	1935	7 months	Dead	Lived	Died	AM. J. OBST. & GYNEC. <b>29</b> : 711- 714, 1935.	
46. James, J. E., Jr. and Lafferty, H. D.	1935	Full term	Dead	Lived	Died	AM. J. OBST. & GYNEC. <b>29</b> : 711- 714, 1935.	
47. James, J. E., Jr. and Lafferty, H. D.	1935	Full term	Dead	Lived	Died	AM. J. OBST. & GYNEC. <b>29</b> : 711- 714, 1935.	
48. Longley, E. G.	1935	8½ months	Dead several hours	3,288	Lived	Am. J. Surg. <b>27</b> : 349-352, 1935.	
49. Posner, A. C.	1935	Full-term prolapsed cervix	Living	3,543	Died	AM. J. OBST. & GYNEC. <b>30</b> : 293- 295, 1935.	
50. Sarkar, A.	1935	28 weeks	Macerated	Lived	Stillborn	J. Obst. & Gynaec. Brit. Emp. <b>42</b> : 1122-1125, 1935.	
51. Stapleton, G.	1935	Full term	Macerated	Lived	Stillborn	Brit. M. J. <b>1</b> : 879, 1935.	
52. Swanson, C. N.	1935	Full term	Dead	Lived	Stillborn	J. Michigan M. Soc. <b>34</b> : 585-589, 1935.	
53. Swanson, C. N.	1935	Full term	Dead	Lived	Stillborn	J. Michigan M. Soc. <b>34</b> : 585-589, 1935.	
54. Swanson, C. N.	1935	Full term	Dead	Lived	Stillborn	J. Michigan M. Soc. <b>34</b> : 585-589, 1935.	
55. Swanson, C. N.	1935	Full term	Living	Lived	Lived	J. Michigan M. Soc. <b>34</b> : 585-589, 1935.	
56. Swanson, C. N.	1935	Full term	Living	Lived	Lived	J. Michigan M. Soc. <b>34</b> : 585-589, 1935.	

## LATE EXTRAUTERINE PREGNANCY

57. Swanson, C. N.	1935	Full term	Dead	Died	Stillborn	J. Michigan M. Soc. 34: 585-589, 1935.
58. Swanson, C. N.	1935	Prenature	Dead	1,105 Lived	Stillborn	J. Michigan M. Soc. 34: 585-589, 1935.
59. Swanson, C. N.	1935	Premature	Dead	Lived	Stillborn	J. Michigan M. Soc. 34: 585-589, 1935.
60. Swanson, C. N.	1935	Premature	Dead	Lived	Stillborn	J. Michigan M. Soc. 34: 585-589, 1935.
61. Swanson, C. N.	1935	Premature	Dead	Lived	Stillborn	J. Michigan M. Soc. 34: 585-589, 1935.
62. Zarfi, M.	1935	2 to 3 weeks before term	Living; deformed	2,039 Died	Lived	Ztschr. f. Kinderh. 57: 505-515, 1935.
63. Anderson, M. W.	1936	Full term	Died at birth; believed to be pri- mary abdominal	2,721 Lived	Died	Brit. M. J. 2: 589-590, 1936.
64. Cathey, A. D.	1936	7 months	Dead	Lived	Tri-State M. J. 8: 1664-1665, 1936.	
65. da Silva, A.	1936	Past term	Living	1,701 Lived	Indian M. Gaz. 71: 590-591, 1936.	
66. Dunham, L. H.	1936	8 months	Dead, deformed	1,389 Lived	Nebraska M. J. 21: 338-340, 1936.	
67. Füth, F.	1936	Full term	Lived 12 days	3,400 Died in 5 days	München. med. Wochenschr. 83: 92. 93, 1936.	
68. Greenhill, J. P.	1936	12 months	Macerated, deformed	Lived	J. A. M. A. 106: 606-608, 1936.	
69. Krishnan, R. G.	1936	Full term	Living	Lived	Brit. M. J. 1: 795, 1936.	
70. Lemaire, M.	1936	8½ months	Mummified	2,440 Lived	Bull. Soc. d'obst. et de gyneec. 25: 204-205, 1936.	
71. Masearetti, M.	1936	8 months	Maccerated, intra- ligamentous	Lived	Clin. obstet. 38: 654-661, 1936.	
72. Pruys, W. M., and Wiersema, J. S.	1936	Full term	Living	Lived	Geneesk. tijdschr. v. Nederl. Indie 76: 3427-3436, 1936.	
73. Schumann, E. A.	1936	Full term	Dead, well formed	2,835 Lived	Am. J. Surg. 33: 570-573, 1936.	
74. Wilson, O. S.	1936	Full term;	Dead; driven vaginal de- livery	Lived	Proc. Roy. Soc. Med. 29: 1651- 1654, 1936.	
75. Wilson, A. S.	1936	8½ months	Living	2,381 Lived	Proc. Roy. Soc. Med. 29: 1651- 1654, 1936.	
76. Wlassow, W. N.	1936	Full term, tubal preg- nancy	Dead	2,880 Lived	Stillborn	Proc. Roy. Soc. Med. 29: 1651- 1654, 1936.

TABLE I—CONT'D

AUTHOR	RE- POR TED	DURATION OF PREGNANCY	STATUS OF FETUS	WEIGHT (GM.)	RESULT		REFERENCE
					MOTHER	BABY	
77. Woods, E. B.	1936	Full term	Living	2,324	Died	Lived	A.M. J. OBST. & GYNÉC. 32: 155. 157, 1936.
78. Bondurant, F.	1937	8½ months	Normal, living; twin to 3½ lb. intrauterine baby that lived 5 days	2,154	Lived	Lived	Illinois M. J. 71: 480-481, 1937.
79. Burke, F. J.	1937	7 months	Macerated, no de- formities	2,494	Died	Stillborn	Brit. M. J. 1: 775, 1937.
80. Burke, F. J.	1937	34 weeks	Macerated, talipes equinovarus	2,267	Lived	Stillborn	Brit. M. J. 1: 775, 1937.
81. Crichton, E. C.	1937	Full term	Dead, slightly de- formed		Lived	Died	South African M. J. 11: 229-230, 1937.
82. Crichton, E. C.	1937	Full term	Lived for a few minutes		Lived	Died	South African M. J. 11: 229-230, 1937.
83. Crichton, E. C.	1937	Full term	Macerated, no deformity	4,082	Lived	Died	South African M. J. 11: 229-230, 1937.
84. Elsholz	1937	Full term	Normal except clubfooted	3,500	Lived	Lived	Ztschr. f. Geburtsh. u. Gynäk. 115: 489-495, 1937.
85. Eno, E., and Towers, A. E.	1937	Full term	Living, deformed	3,345	Died	Lived	Chinese M. J. 51: 33-40, 1937.
86. Eno, E., and Towers, A. E.	1937	Full term	Lived 6 hours		Lived	Died	Chinese M. J. 51: 33-40, 1937.
87. Friedman, S. L.	1937	7 months	Macerated		Lived	Stillborn	A.M. J. OBST. & GYNÉC. 33: 683. 686, 1937.
88. Hoffman, W. E.	1937	Near term	Lived 12 hours	2,097	Lived	Died	West Virginia M. J. 33: 496-497, 1937.
89. Karki-Palwa, R. R. D.	1937	14½ months	Dead for some time	5,443	Lived	Stillborn	Lancet 1: 1228, 1937.
90. Kreis, J.	1937	Full term	Lived, Cesarean delivery		Lived	Lived	Rev. frane, de gynée, et d'obst. 32: 89-116, 1937.
91. Kyriakis, L.	1937	8 months	Lived 40 hours		Lived	Died	Gatrika chronica (Greek, 1937; abst. Zentralbl. f. Gynäk. 64: 991, 1940).
92. Lailey, W. W.	1937	4 to 5 weeks over term	Overnature, living, clubfooted	5,017	Lived	Lived	Canad. M. A. J. 36: 67-68, 1937.

## LATE EXTRAUTERINE PREGNANCY

93. MacGregor, A. S.	1937	Near term	Living, slight deformity corrected	2,661	Lived	Lived	AM. J. OBST. & GYNEC. 34: 1030-1032, 1937.
94. Marchisio, V.	1937	Full term	Living	1,947	Died in 5 days	Lived	Gynecologia 3: 35-46, 1937.
95. Marchisio, V.	1937	Full term	Dead	Lived	Stillborn	Stillborn	Gynecologia 3: 35-46, 1937.
96. McNeile, L. G.	1937	7 months	Normal, living	Lived	Lived	Lived	West. J. Surg. 45: 119-133, 1937.
97. Opoher, E.	1937	Near term	Lived, 4 hours	3,457	Lived	Died	Rassegna di ostet. e. ginec. 46: 59-73, 1937.
98. Parker, P. E.	1937	Full term	Shriveled, faint heart beat at 10th month	Lived	Stillborn	Stillborn	J. Tennessee M. A. 30: 163-165, 1937.
99. Roques, F., and Winterton, W. R.	1937	49 weeks	Dead	Lived	Stillborn	Stillborn	J. Obst. & Gynaec. Brit. Emp. 44: 687-695, 1937.
100. Schorsch, W.	1937	Full term, ovarian pregnancy	Living, normal	3,000	Died in 1 day	Lived	Arch. f. Gynäk. 162: 371-378, 1937.
101. Stavenhagen, K.	1937	Full term	Living	3,300	Lived	Lived	Med. Klin. 33: 1609-1610, 1937.
102. Stoel, G.	1937	Full term	Lived 24 hours	2,400	Lived	Died	Nederl. tijdschr. v. geneesk. 81: 1021-1024, 1937.
103. Varner, H. H., and Green, L., Jr.	1937	Full term, tubal pregnancy	Dead		Died	Stillborn	Southwestern Med. 21: 191-196, 1937.
104. Waters, E. P.	1937	Full term	Lived, clubfooted; only partly outside uterus; previous section scar torn		Lived	Lived	Brit. M. J. 1: 1158, 1937.
105. Bray, F. N.	1938	8 months	Newly dead	1,353	Lived	Stillborn	Minnesota Med. 21: 498-500, 1938.
106. Champion, P. K., and Tessitore, N. J.	1938	10 months	Macerated	3,855	Lived	Stillborn	AM. J. OBST. & GYNEC. 36: 281-293, 1938.
107. Creeca, W. D., and Cacciarelli, R. A.	1938	Full term	Living	2,664	Lived	Lived	AM. J. OBST. & GYNEC. 36: 312-313, 1938.
108. Gaines, C. D., Collins, C., and Brown, H.	1938	7 months	Lived 7 hours, sac ruptured 1 week before birth	1,871	Died	Died	South. M. J. 31: 1278-1280, 1938.
109. Gaines, C. D., Collins, C., and Brown, H.	1938	Full term	Macerated		Lived	Stillborn	South. M. J. 31: 1278-1280, 1938.
110. Gerrard, E. A.	1938	Full term	Macerated		Lived	Stillborn	Clin. J. 67: 116-118, 1938.
111. Hardy	1938	8 months	Calcified, dead 10 years		Lived	Stillborn	Reported by Champion-Tessitore.

TABLE I—CONT'D

AUTHOR	RE- PORTED	DURATION OF PREGNANCY	STATUS OF FETUS	WEIGHT (G.M.)	RESULT		REFERENCE
					MOTHER	BABY	
112. Harkness, J., and Bell, F.	1938	Full term	Dead, vertex pre- sentation through vagina	3,401	Died	Died	Brit. M. J. <b>2</b> : 1044, 1938.
113. Hellman, A. M., and Simon, H. J.	1938	Full term	Macerated		Lived	Stillborn	Am. J. OBST. & GYNÉC. <b>35</b> : 289- 294, 1938.
114. Jennings, D., and Hunsucker, W. C.	1938	7 months	Living		Lived	Lived	South. M. & S. J. <b>100</b> : 585-589, 1938.
115. Kauffman, L. G., and Finley, R. K., and King, H. E.	1938	Unknown	Dismembered fetal bones		Died	Stillborn	Ohio State M. J. <b>34</b> : 525-527, 1938.
116. Konig, H.	1938	7 months	Lived 12 months	850	Lived	Died	Zentralbl. f. Gynäk. <b>62</b> : 2322-2326, 1938.
117. Lelling, E.	1938	7 months	Died at birth, deformed	38 cm. long	Died	Died	Zentralbl. f. Gynäk. <b>62</b> : 2209-2214, 1938.
118. Novey, M. A.	1938	Full term	Greatly macerated		Lived	Stillborn	Surg., Gynec. & Obst. <b>66</b> : 671-676, 1938.
119. Novey, M. A.	1938	Near term	Dead		Died	Stillborn	Surg., Gynec. & Obst. <b>66</b> : 671-676, 1938.
120. Novey, M. A.	1938	40 weeks	Large, macerated	3,798	Died	Stillborn	Surg., Gynec. & Obst. <b>66</b> : 671-676, 1938.
121. Novey, M. A.	1938	Near term	Living, deformed feet	2,494	Lived	Lived	Surg., Gynec. & Obst. <b>66</b> : 671-676, 1938.
122. Novey, M. A.	1938	Term?	Living, normal	2,693	Lived	Lived	Surg., Gynec. & Obst. <b>66</b> : 671-676, 1938.
123. Payne, R. H.	1938	14 months	Dead	3,288	Lived	Stillborn	AM. J. OBST. & GYNÉC. <b>36</b> : 693- 697, 1938.
124. Posner, A. C.	1938	10 months	Macerated	2,381	Lived	Stillborn	AM. J. OBST. & GYNÉC. <b>36</b> : 693-697, 1938.
125. Posner, A. C.	1938	7 months	Dead	1,275	Lived	Stillborn	
126. Ramirex Olivella, J., Barroso, L., and Machado, O.	1938	Full term	Living	3,175	Lived	Lived	Vida neuva <b>42</b> : 605-611, 1938.
127. Ritsema van Eck, C. R.	1938	Full term	Living	3,170	Lived	Lived	Geneesk. tijdschr. v. Nederl. Indie. <b>78</b> : 1711-1713, 1938.
128. Stabler, F.	1938	Full term	Living, tempo- rarily deformed	2,381	Lived	Lived	Brit. M. J. <b>1</b> : 779-780, 1938.
129. Tarleton, L.	1938	10 months	Dead, overture		Lived	Stillborn	Brit. M. J. <b>2</b> : 569, 1938.

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130. Bergenfeldt, E.	1939	Full term	Died after 4 hours	2,850	Lived	Died	Acta obst. et gynec. scandinav.
131. Bishop, B. W. F.	1939	Full term	Living	2,494	Lived	Lived	19: 274-289, 1939. South African M. J. 13: 167-168, 1939.
132. Corbet, T. M.	1939	Full term, tubal rupt- ture at 7 months	Dead	2,381	Lived	Stillborn	
133. Cunningham, J. F.	1939	8 months	Dead	1,105	Lived	Stillborn	Irish J. M. Sc. pp. 846-847, 1939.
134. Cunningham, J. F.	1939	Full term	Living	1,927	Lived	Lived	Irish J. M. Sc. pp. 846-847, 1939.
135. Gepfert, J. R.	1939	4 weeks over term	Died just before op- eration, ruptured into abdomen through cesarean section scar	2,381	Lived	Died	AM. J. OBST. & GYNÉC. 37: 466- 472, 1939.
136. Hains, I. C.	1939	Full term	Living	3,515	Lived	Lived	M. J. Australia 1: 268-269, 1939.
137. Lemgruber, S., and Paizao, W.	1939	Full term	Dead	3,515	Lived	Stillborn	An. Brasil. de gynæc. 8: 302-312, 1939.
138. Mathieu, A.	1939	26 years	Lithopedia	37 g	Lived	Stillborn	AM. J. OBST. & GYNÉC. 37: 297- 302, 1939.
139. Smyth, G. S., and Mackintosh, R. H.	1939	14 months	Slightly macerated	3,515	Lived	Stillborn	South African M. J. 13: 320-321, 1939.
140. Snow, W.	1939	Near term	Lived 5 hours	3,515	Lived	Died	Am. J. Roentgenol. 41: 537-540, 1939.
141. Vastesaeger, M., and de Toent, G.	1939	8½ months	Living	2,030	Lived	Lived	Bruxelles-med. 19: 333-338, 1939.
142. Acosta-Sison, H., and Espinola, N. A.	1940	Full term	Living	3,800	Lived	Lived	Acta med. Phillipina 2: 31-36, 1940.
143. Ayres, Netto P., et al.	1940	Full term	Dead several hours	3,800	Lived	Stillborn	Bol. Soc. de med. e cir de sao Paulo 23: 8-23, 1939.
144. Ayres, Netto P.	1940	Full term	Dead several hours	3,800	Lived	Stillborn	Bol. Soc. de med. e cir de sao Paulo 23: 8-23, 1939.
145. Beal, A. M., and Cassel, N. S.	1940	Full term	Died at delivery; left foot had pierced broad lig- ament, foot de- formed	3,175	Lived	Stillborn	J. Iowa M. Soc. 30: 445-447, 1940.
146. Becker, C.	1940	7 months	Died at birth	1,200	Lived	Died	Zentralbl. f. Gynäk. 64: 2067-1068, 1940.
147. Capellara, V. M.	1940	Full term	Dead	1,200	Lived	Stillborn	Rev. med. veracruzana 20: 3119- 3121, 1940.

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AUTHOR	RE- POR TED	DURATION OF PREGNANCY	STATUS OF FETUS	WEIGHT (GM.)	RESULT		REFERENCE
					MOTHER	BABY	
148. Chung, C. T.	1940	14 months	Dead, well developed, dehydrated	1,980	Lived	Stillborn	Chinese M. J. 57: 184-185, 1940.
149. Elkins, H. B., and Bowdle, R. A.	1940	Full term	Macerated	2,948	Lived	Stillborn	Am. J. Surg. 49: 116-117, 1940.
150. Gavaldon Salamanca, A.	1940				Lived	Died	J. Internat. Coll. Surgeons 3: 271-272, 1940.
151. Gomez Azcarate, G.	1940	Full term	Living		Lived	Lived	Cir. Y. cirujanos 8: 179-190, 1940.
152. Gomez Azcarate, G.	1940	Full term	Living		Lived	Lived	Cir. Y. cirujanos 8: 179-190, 1940.
153. Gomez Azcarate, G.	1940	Full term	Living		Lived	Died	Cir. Y. cirujanos 8: 179-190, 1940.
154. Gomez Azcarate, G.	1940	Full term	Living		Lived	Died	Cir. Y. cirujanos 8: 179-190, 1940.
155. Gomez Azcarate, G.	1940	Full term	Living		Lived	Died	Cir. Y. cirujanos 8: 179-190, 1940.
156. Hamblen, N.	1940	Full term	Lived 3 hours	2,324	Lived	Died	West. J. Surg. 48: 310-312, 1940.
157. Leinzinger, E.	1940	Full term	Macerated, deformed	3,000	Lived	Stillborn	Zentralbl. f. Gynäk. 64: 1506, 1940.
158. Lull, C. B.	1940	7 months	Died at birth		Died in 8 hours	Died	Am. J. OBST. & GYNEC. 40: 194-202, 1940.
159. Lull, C. B.	1940	7½ months	Macerated		Died in 4 months of T.B.	Stillborn	Am. J. OBST. & GYNEC. 40: 194-202, 1940.
160. Lull, C. B.	1940	8½ months	Living	2,211	Lived	Lived	Am. J. OBST. & GYNEC. 40: 194-202, 1940.
161. Nicodemus, R. E., and Carigg, L. G.	1940	7½ months	Died at birth	2,069	Lived	Died	Am. J. OBST. & GYNEC. 39: 153-154, 1940.
162. Oghi, A.	1940	Full term	Macerated		Died in 36 hours	Stillborn	Semana med. 2: 1311-1313, 1940.
163. von Pallos, K.	1940	Full term	Macerated		Lived	Stillborn	Zentralbl. f. Gynäk. 64: 1052-1061, 1940.
164. von Pallos, K.	1940	14 months	Dead		Lived	Stillborn	Zentralbl. f. Gynäk. 64: 1052-1061, 1940.
165. Richter, W.	1940		No details		Lived	Lived	Zentralbl. f. Gynäk. 64: 1505-1506, 1940.
166. Richter, W.	1940		No details		Lived	Stillborn	Zentralbl. f. Gynäk. 64: 1505-1506, 1940.
167. Richter, W.	1940		No details		Lived	Stillborn	Zentralbl. f. Gynäk. 64: 1505-1506, 1940.
168. Satta Flores, G.	1940	8 months	Lived 24 hours	3,070	Lived	Died	Clin. obstet. 42: 306-313, 1940.
169. Sigwart, W.	1940	8 months	Dead		Lived	Stillborn	Zentralbl. f. Gynäk. 64: 1906-1911, 1940.

## LATE EXTRAUTERINE PREGNANCY

170. Slinger, L. A. P.	1940	Full term	Dead	3,175	Lived	Stillborn	Brit. M. J. 1: 91, 1940.
171. Soikkonen-Bardy, A.	1940	Full term	Macerated	1,790	Lived	Stillborn	Duodecim. 56: 159-163, 1940.
172. Sprague, J. R., and	1940	Full term	Lived 48 hours	3,231	Lived	Died	Ohio State M. J. 36: 520-521, 1940.
Chappel, M. R.							
173. Tejerina Fothering-	1940	Full term	Living	2,400	Lived	Lived	Bol. Soc. de obst. ginec. 19: 657.
ham, W.							669, 1940.
174. Ghosh, S. K.	1941	12 months	8 to 9 months' dead fetus		Lived	Stillborn	Caleutta M. J. 38: 301-304, 1941.
175. Langes, E.	1941	Full term	Living	3,500	Died in 1 hr.	Lived	Zentralbl. f. Gynäk. 65: 819-822,
176. Leech, R. B.	1941	Full term <sup>i</sup>	Lived $\frac{1}{2}$ hour, sac ruptured 22 days earlier after delivery of $5\frac{1}{2}$ pound intrauterine living twin	2,721	Lived	Died	1941.
							Brit. M. J. 2: 805, 1941.
177. Matusovsky, A.	1941	Full term	Living	3,400	Lived	Lived	Radiology 38: 35-38, 1942.
178. Ney de Almeida	1941	Full term	Living	2,270	Lived	Lived	Geburtsch. u. Frauensch. 3: 242-246,
179. Nicholls, R. B.	1941	10 month ovarian	Living	4,620	Lived	Lived	An. brasil. de ginec. 12: 299-307,
180. Renner, M. J.	1941	Full term	Living	3,061	Lived	Lived	1941.
181. Schwarz, M.	1941	Full term	Living		Lived	Lived	AM. J. OBST. & GYNEC. 42: 341-
182. Speiser	1941	7 months	Dead	2,340	Lived	Stillborn	342, 1941.
183. Tornqvist, G. W.	1941	3 weeks over term	Living, normal	4,100	Died	Lived	J. Kansas M. Soc. 42: 245-247,
184. Vierira Marcondes,	1941	Full term	Living	2,800	Lived	Lived	1941.
A.							Zentralbl. f. Gynäk. 65: 204-209,
185. Weintraub, M., and	1941	7 months	Macerated			Stillborn	Zentralbl. f. Gynäk. 65: 1056-1062,
Weintraub, D. I.							1941.
186. White, R. A.	1941	Full term	Made a few feeble movements	2,267	Lived	Died	Acta obst. e. gynec. scandinav. 21:
187. Hamilton, W. S., and	1942	7 months	Dead, poorly developed	13 inches long	Lived	Stillborn	100-102, 1941.
Steingrube, C. R.				2,381	Lived	Lived	Revista de dined. e d'obst. 35: pt.
188. Lucas, C. F.	1942	8 months	Lived				1, 4-15, 1941.
		tubal, early rupture					Am. J. Surg. 54: 747-752, 1941.
189. Mattingly, D., and	1942	Full term	Dead			Died	North Carolina M. J. 2: 87-92,
Menville, L. J.							1941.
							Cincinnati J. Med. 23: 477-488,
							1942.
							Brit. M. J. 1: 722, 1942.

TABLE I—CONT'D

AUTHOR	RE- PORTED	DURATION OF PREGNANCY	STATUS OF FETUS	WEIGHT (GM.)	RESULT		REFERENCE
					MOTHER	BABY	
190. Mattingly, D., and Menville, L. J.	1942	Full term	Dead	Lived	Stillborn	Radiology 38: 35-38, 1942.	
191. Mattingly, D., and Menville, L. J.	1942	Full term	Normal, living	Lived	Lived	Radiology 38: 35-38, 1942.	
192. Mattingly, D., and Menville, L. J.	1942	8 months	Dead	Lived	Stillborn	Radiology 38: 35-38, 1942.	
193. Mattingly, D., and Menville, L. J.	1942	7 months	Dead	Lived	Stillborn	Radiology 38: 35-38, 1942.	
194. Netto, P.	1942	Full term	Living	Died	Lived	Med. cir. pharm. pp. 455-466, 1942.	
195. Schulze, H.	1942	10 months	Dead	Lived	Stillborn	Zentralbl. f. Gynäk. 66: 455-468, 1942.	
196. Slotover, M. L.	1942	Full term	Macerated	Lived	Stillborn	Brit. M. J. 1: 669, 1942.	
197. Wallau, F.	1942	14 days before term, tubal pregnancy	Living	2,040	Lived	Zentralbl. f. Gynäk. 66: 1298-1308, 1942.	
198. Wade, E. R.	1942	Full term	Dead	2.3 kg.	Lived	Brit. M. J. 1: 916-917, 1946.	
199. Hart, S. D.	1943	7 months	Macerated	Lived	Stillborn	West. J. Surg. 51: 280-282, 1943.	
200. Hudgins, A. P.	1943	7½ months	Dead, anencephalic	Lived	Stillborn	South. M. J. 36: 678-680, 1943.	
201. Kobak, A. J.	1943	15 months	Dead, clubfooted	19 cm.	Stillborn	Am. J. OBST. & GYNEC. 46: 577-579, 1943.	
202. Loveless, P. H., and Austin, C. P.	1943	13 months	Macerated	2,523	Lived	Southwest. Med. 27: 301-303, 1943.	
203. Lubin, S., and Waltman, R.	1943	11 months	Macerated	1,190	Lived	Am. J. Surg. 60: 298-300, 1943.	
204. Martin, P. J., and Grier, M. E.	1943	8 months	Macerated	Lived	Stillborn	Nebraska M. J. 28: 148-149, 1943.	
205. Penick, G.	1943	Full term	Mummified	Lived	Stillborn	J. Oklahoma M. A. 36: 192-195, 1943.	
206. Pizarro, J. J.	1943	Full term	Macerated	Lived	Stillborn	Hospital (Rio de Janeiro) 24: 253-272, 1943.	
207. Poddar	1943	7 months	Dead	1,757	Lived	Stillborn Indian M. Gazette 78: 434-436, 1943.	
208. Poddar	1943	Term?	Dead	3,175	Lived	Stillborn Indian M. Gazette 78: 434-436, 1943.	
209. Poddar	1943	Full term	Dead, monster	Lived	Stillborn Indian M. Gazette 78: 434-436, 1943.		
210. Rajoo, T. D., and Maddimsetti, H. P.	1943	Term	Lithopedion, died 5 mo. after rupture of sac	Lived	Stillborn Indian M. Gazette 78: 433-434, 1943.		

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211. Schaupp, K. L.	1943	Full term	Living	2,833	Lived	Lived	West. J. Surg. 51: 491-493, 1943.
212. Shannon, D., and Heller, E. L.	1943	7 months' tubal pregnancy; de- livered at autopsy of mother who died of generalized T.B.	Died	Stillborn	Stillborn	AM. J. OBST. & GYN. 45: 345- 350, 1943.	
213. Strumpf, I. J.	1943	Full term	Living, normal	Lived	Lived	AM. J. OBST. & GYN. 45: 350- 353, 1943.	
214. Thomas, R. C.	1943	34 weeks	Macerated	Lived	Stillborn	J. Obst. & Gynaec. Brit. Emp. 50: 189-195, 1943.	
215. Aroskar, B. V.	1944	Full term	Well developed, lived 4 days	2,778	Died	M. Bull. Bombay 12: 1-5, 1944.	
216. Bercovitz, N.	1944	12 months	Dead	Died	Stillborn	Chinese M. J. 62: 197-198, 1944.	
217. Gravito, R.	1944	Full term	Normal, living	2,900	Lived	Obst. & Gynec. Latino-am. 2: 213- 216, 1944.	
218. Denon, H. L., Jr., and Henderson, W. C.	1944	8 months	Retained 8 years	Lived	Stillborn	Am. J. Surg. 63: 257-258, 1944.	
219. Dibbins, S. A.	1944	Full term	Lithopedion	4,195	Lived	Stillborn	
220. Gardner, A. R., and Middlebrook, G.	1944	Full term	Living	2,239	Lived	Lived 4½ months	
221. Grusetz, M. W., and Polayes, S. H.	1944	Full term	Macerated	Lived	Stillborn	AM. J. OBST. & GYN. 48: 379- 386, 1944.	
222. Lin, A. Y.	1944	Full term	Lived 2 hours, de- formed	Lived	Died	Chinese M. J. 62: 383-387, 1944.	
223. Pearson, J. W., Jr., and Parks, J.	1944	7 months	Lived 12 hours	1,333	Lived	AM. J. OBST. & GYN. 47: 127- 129, 1944.	
224. Pump, K. K.	1944	12 months	Dead	2,267	Lived	Bull. Vancouver M. A. 20: 110- 111, 1944.	
225. Greene, G. G.	1945	Full term	Large, macerated	Lived	Stillborn	South. M. J. 38: 747-752, 1945.	
226. Greene, G. G.	1945	7 months	Macerated	Lived	Stillborn	South. M. J. 38: 747-752, 1945.	
227. Greene, G. G.	1945	Full term	Died at birth	Lived	Died	South. M. J. 38: 747-752, 1945.	
228. Morgan, R. G., and Keevil, N. L.	1945	About 8 months	Lived 1 hour	Lived	Died	Brit. M. J. 2: 640, 1945.	
229. Rose, M. J.	1945	Full term	Living, normal	2,324	Lived	J. Florida M. A. 31: 475-476, 1945.	
230. Sellah, L. G., and Hill, W. C. O.	1945	Full term,	Dead, well de- veloped	1,389	Died	J. Obst. & Gynaec. Brit. Emp. 52: 71-74, 1945.	
231. Smoke, P. O.	1945	Near term	Died 1 week be- fore operation, macerated	2,721	Lived	Stillborn	Urol. & Cutan. Rev. 49: 338-340, 1945.

TABLE I—CONT'D

AUTHOR	RE- PORTED	DURATION OF PREGNANCY	STATUS OF FETUS	WEIGHT (GM.)	RESULT		REFERENCE
					MOTHER	BABY	
232. Armand, M. F., and Sam, F. G.	1946	Full term	Normal, well formed	3,401	Lived	Lived	Obst. & Gynec. Latino-am. 4: 20-26, 1946.
233. Beacham, W. D., and Beacham, D. W.	1946	7½ months	Dead, macerated		Lived	Stillborn	Obst. & Gynec. Survey 1: 777-806, 1946.
234. Beacham, W. D., and Beacham, D. W.	1946	Full term	Well formed	3,543	Lived	Died	Obst. & Gynec. Survey 1: 777-806, 1946.
235. Beacham, W. D., and Beacham, D. W.	1946	Near term	Dead, deformed jaw, clubfooted not delivered	2,976	Died	Stillborn	Obst. & Gynec. Survey 1: 777-806, 1946.
236. Beacham, W. D., and Beacham, D. W.	1946	Full term	Dead, macerated		Lived	Stillborn	Obst. & Gynec. Survey 1: 777-806, 1946.
237. Beacham, W. D., and Beacham, D. W.	1946	7 months	Dead, macerated		Lived	Stillborn	Obst. & Gynec. Survey 1: 777-806, 1946.
238. Beacham, W. D., and Beacham, D. W.	1946	Near term	Dead, macerated tubal		Lived	Stillborn	Obst. & Gynec. Survey 1: 777-806, 1946.
239. Beacham, W. D., and Beacham, D. W.	1946	10 months, tubal, rupture	Dead, macerated		Lived	Stillborn	Obst. & Gynec. Survey 1: 777-806, 1946.
240. Beacham, W. D., and Beacham, D. W.	1946	8 months	Dead, macerated		Lived	Stillborn	Obst. & Gynec. Survey 1: 777-806, 1946.
241. Beacham, W. D., and Beacham, D. W.	1946	Full term	Dead, macerated		Lived	Stillborn	Obst. & Gynec. Survey 1: 777-806, 1946.
242. Beacham, W. D., and Beacham, D. W.	1946	8 months	Living		Lived	Lived	Obst. & Gynec. Survey 1: 777-806, 1946.
243. Beacham, W. D., and Beacham, D. W.	1946	Full term	Dead		Lived	Stillborn	Obst. & Gynec. Survey 1: 777-806, 1946.
244. Beacham, W. D., and Beacham, D. W.	1946	7 months	Living, abnormal		Lived	Died	Obst. & Gynec. Survey 1: 777-806, 1946.
245. Beacham, W. D., and Beacham, D. W.	1946	Full term	Dead		Lived	Stillborn	Obst. & Gynec. Survey 1: 777-806, 1946.
246. Beacham, W. D., and Beacham, D. W.	1946	Full term	Calcified		Lived	Stillborn	Obst. & Gynec. Survey 1: 777-806, 1946.
247. Kushner, D. H., and Dobrzynski, F. A.	1946	8 months	Macerated, deformed		Lived	Stillborn	A.M. J. OBST. & GYN. 52: 160-161, 1946.
248. Lee, A. F.	1946	Full term	Living	2,778	Lived	Lived	Northwest Med. 45: 40-41, 1946.
249. Waters, H. S.	1946	Full term, tubal rupture, 4 months	Living	3,175	Lived	Lived	J. Obst. & Gynaec. Brit. Emp. 53: 285-288, 1946.

baby weighing 10 pounds, 3 ounces lived; another that was four to five weeks overdue weighing 11 pounds, 1 ounce, also lived. Most of the babies that lived were delivered at term; none were under seven months.

Bland reported a maternal mortality rate of 34.7 per cent for 240 cases of late extrauterine pregnancy collected from the literature from 1813 to 1907, and a mortality rate of 16.7 per cent for sixty-one cases collected from 1907 to 1923.

Cornell and Lash reported a maternal mortality of 14.3 per cent in 236 collected cases of abdominal pregnancy (Table I).

All thirteen of our personally observed cases\* occurred in Negro patients, although only about one-half of the obstetric patients in the Medical College of Virginia Hospitals are of this race. Early ectopic pregnancies in these hospitals occur in about the same percentage of white and Negro patients. The fact that late extrauterine cases occurred only among the Negro patients may indicate that these women sought medical care after their symptoms had persisted for a long period of time.

Most of our patients were between the ages of 25 and 35 years. Four were between 20 and 25 years, five between 26 and 30 years, three between 31 and 35 years, and one was 40 years old.

Previous operations could not be a factor in this series because not one of the patients had ever been subjected to a laparotomy.

TABLE II. THIRTEEN PERSONALLY OBSERVED CASES OF LATE EXTRAUTERINE PREGNANCY, DURATION OF PREGNANCY, CONDITION OF FETUS, MORTALITY

CASE	YEAR	AGE OF MOTHER	PREVIOUS PREGNANCIES	WEIGHT (GRAMS)	DURATION OF PREGNANCY CONDITION OF FETUS	RESULT	
						MOTHER	CHILD
1	1930	40	gravida iii para i	2,230	40 weeks living and normal	died 7 days after operation	lived
2	1932	25	gravida iii para ii	2,680	42 weeks macerated	lived	stillborn
3	1932	34	gravida i para 0	2,438	48 weeks macerated	lived	stillborn
4	1932	20	gravida i para 0	2,069	36 weeks living and normal	lived	lived
5	1934	25	gravida ii para i		15 months macerated	lived	stillborn
6	1935	36	gravida iv para ii		28 weeks macerated	lived	stillborn
7	1935	23	gravida ii para i	4,422	44 weeks macerated hydrocephalic	died 18 hours after operation	stillborn
8	1936	32	gravida iii para ii	3,487	42 weeks macerated	died 3 months after operation of other conditions	stillborn
9	1937	30	gravida iii para ii	1,474	24 months macerated, unruptured tubal pregnancy	lived	stillborn
10	1937	26	gravida iii para 0	3,033	36 weeks living and normal	lived	lived
11	1944	32	gravida iv para ii	2,891	40 weeks living and normal	lived	lived
12	1945	22	gravida ii para 0	3,005	44 weeks not delivered	died before operation	stillborn
13	1946	30	gravida ii para i	2,664	38 weeks living and normal	lived	lived

\*For lack of space, the detailed case reports are not included.

Nine patients gave a history of one or more spontaneous deliveries prior to the extrauterine pregnancy and three of these reported, in addition, one or more spontaneous abortions. Two patients had abortions previously but no full-term pregnancies. Two patients had no earlier pregnancy, and one of these has since had a normal term intrauterine pregnancy.

The maternal mortality in late extrauterine pregnancy remains too high. Experience with our cases and a review of the literature convinces us that leaving the placenta with no attempt to separate it whenever its removal might cause hemorrhage or other difficulties reduces the mortality in patients with extrauterine pregnancy.

Operation for a late extrauterine pregnancy, as in any ectopic pregnancy, should be performed as rapidly as possible after the diagnosis is made, because of the high maternal mortality rate in cases of 28 weeks' or more duration. As shown in an earlier communication by the author, the maternal mortality rate in 115 cases of early ectopic pregnancy was 1.7 per cent, whereas in the thirteen cases of late extrauterine pregnancy, the maternal mortality rate was 30.76 per cent.

This opinion is in agreement with that of Bland and Montgomery (1939), who stated that recognition of ectopic gestation prior to rupture calls for immediate removal, for the welfare of the mother comes first, and operative methods should be instituted regardless of the stage of the pregnancy. A gestation of four or five months, they stated, calls for prompt removal, but there is less urgency in the eighth or ninth month, and the operation may be deferred two or three weeks in order to save the infant, unless there is a false labor with death of the child. Champion and Tessitore (1938) believe that if the infant is viable, operation with conservative handling of the placenta is indicated; if the fetus is dead, operation should be deferred six to eight weeks until the placental circulation has atrophied. DeLee suggested deferment from seven to twenty days for the same reason, but Beck believed, as McNeile (1937) points out, that in the interest of the child it may be desirable to postpone operation until after the thirty-eighth week. Tonneau disagreed, stating that there is risk of a secondary infection of the fetal sac, as shown in his case in which the fetus was within Douglas' pouch. He believed the infection was from the intestine.

In our own series of thirteen cases, seven fetuses were macerated, one of them having hydrocephalus. Winckel's statement in 1904 that half of the fetuses in ectopic pregnancy are deformed has been frequently challenged, but Bland in 1939 stated that healthy infants are rarely found, that usually they die within a few hours or days after delivery, and more than one-half are deformed. Mahfouz, however, in 1938 reported that in his series of 120 cases the fetuses which advanced to term, whether inside or outside the tube, showed little or no deformity, and the babies would certainly have been saved if the patients had been admitted in time. Some of the fetuses which died at an early age showed marked malformations, and about 3 per cent were calcified. One of his patients had carried the fetus for fifteen years and had four living babies in the meantime. Mundell in 1933 reported a deformity in eight of forty-nine live babies; in thirty-four dead babies there was deformity in one, and twenty-eight were macerated. In Champion and Tessitore's series, thirty-seven fetuses died (58 per cent), and one-half were macerated. In several instances the fetus was retained for many years, in Hardy's case for ten years, in Galabin's case, for twenty-one years.

It is also evident that many more mothers and babies can be saved when late extrauterine pregnancy exists, if women advanced in pregnancy are examined more carefully. A correct diagnosis before the induction of labor or abdominal delivery is attempted enables the operator to anticipate unusual difficulties, and consequently reduces the risk to the patient.

In five of our thirteen cases the fetuses were alive when the mothers were admitted to St. Philip Hospital.\* These five babies were delivered alive, appeared to be normal, and were living when last heard from. This gives a fetal survival rate of 38.46 per cent for the entire group, and a fetal survival rate of 100 per cent for those alive when the mother was admitted to the hospital. Four of the five mothers having living babies survived. The fifth mother (Case 1) died of bronchopneumonia and peritonitis seven days after operation, probably because of manipulation before operation and removal of the placenta and uterus. There were four maternal deaths (30 per cent), all occurring in patients with abdominal pregnancies. However, one died of other causes than the pregnancy, so that the true mortality rate was only 25 per cent (Table III).

TABLE III. LATE EXTRAUTERINE PREGNANCY AFTER THE TWENTY-EIGHTH WEEK

LOCATION OF PREGNANCY	NUMBER OF CASES	CONDITION OF BABY			CONDITION OF MOTHER		
		ALIVE	STILL-BORN	MORTALITY RATE (PER CENT)	RECOVERED	DIED	MORTALITY RATE (PER CENT)
Broad ligament	4	0	4	100	4	0	0
Fallopian tube	1	0	1	100	1	0	0
Abdominal	7	5	2	28.57	4	3	42.85
Abdominal (post-mortem operation)	1	0	1	100	0	1	100
Total	13	5	8	61.53	9	4	30.76

Three patients died in eighteen hours, five days, and three months, respectively, after operation. The fourth patient was too ill to operate upon, and died undelivered (Table II).

The possibility of an extrauterine pregnancy is suggested by the presence of the fetus in an abnormal position and a long, thick, unefaced cervix which is still fairly firm and closed. If the cervix is in an abnormal position the evidence of extrauterine pregnancy is increased.

Uterine contractions which occurred at regular intervals and were both strong and painful were observed in one instance (Case 2). The histories of other patients suggest that rhythmical uterine contractions associated with pain and simulating labor may occur about the thirty-sixth week in most patients with extrauterine pregnancies. Several of our patients who gave such a history unfortunately were not admitted to the hospital until after that period.

If the fetus is viable and near term the fetal heart sounds are usually louder in abdominal pregnancy than in a normal intrauterine pregnancy.

A positive diagnosis of extrauterine pregnancy frequently can be made after a careful history and an abdominal and vaginal examination. In some cases roentgen studies or a hysterosalpingogram may be necessary to confirm the diagnosis. Roentgen studies were made in all of our cases to confirm the diagnosis, and hysterosalpingograms were made on a few. We were unable to obtain any hysterosalpingogram which showed the relationship of the uterus and Fallopian tubes to the pregnancy as clearly as the one reported by Greenhill.

A history of persistent pelvic or abdominal pain after the second or third month of pregnancy was obtained from ten patients in this series, and the other three patients complained of pelvic and abdominal pain during the latter months of pregnancy. This is the most frequent symptom of extrauterine pregnancy. Therefore, whenever it is obtained from a patient with an advanced gestation, extrauterine pregnancy must be thought of, and ruled out.

\*The St. Philip Hospital for Negro patients is one of the Medical College of Virginia Hospitals.

Less frequent, but equally suggestive, is a history of severe indigestion, constipation, and loss of weight. Frequently these symptoms are associated with anemia. In more than half of the cases the fetal movements were reported as either very high or very low. The latter symptom was associated most frequently with intraligamentous pregnancy.

The position of the fetus is usually high in abdominal pregnancy, and in most of these cases the baby is extended or at least poorly flexed. In Case 12 the fetus was unusually high in the abdomen, but otherwise its attitude seemed normal. It is possible for an abdominal pregnancy to have such a thick sac that the fetus may be flexed almost as much as it is in a normal uterus. On abdominal palpation the fetus is usually noted in close proximity to the anterior abdominal wall. In broad-ligament pregnancy the baby is usually below the level of the umbilicus, assumes an abnormal position, and frequently seems compressed and overflexed, as demonstrated by roentgen examination of four such patients in this series.

In late extrauterine pregnancy a vaginal examination usually reveals certain characteristic findings. The cervix is long, thick, and fairly firm. The cervical canal is usually closed, but about the thirty-sixth week it will sometimes admit one finger. We have not seen any case in which the cervix was soft as it is in an intrauterine pregnancy at term. If the pregnancy is intraligamentous, the cervix is usually in an abnormal position, frequently high, and pushed to one side. In abdominal pregnancy the cervix is in an abnormal position only when the placenta is attached in the pelvis or at the pelvic inlet. The position of the cervix varies as the position of the uterus changes. The size of the uterus usually increases to that of a three months' pregnancy. After death of the fetus the uterus slowly returns to normal size.

The dangers of unnecessary attempts to induce labor with pituitrin and too much manipulation, especially attempts to rupture the membranes and other mechanical methods of initiating labor, are illustrated in three cases (Cases 1, 7 and 12). Three of the four patients who died had received earlier treatment at home or in other hospitals in an effort to induce labor before the correct diagnosis was made. These patients were admitted to the St. Philip Hospital because the cervix had not dilated and they could not be delivered. Patient No. 1 had thought she was in labor for four days before entering the hospital, and it seems probable that the correct diagnosis was not made until the time of operation on this patient. In all other instances the correct diagnosis was made previous to operation. In one case (Case 7) the diagnosis was made and the patient operated upon the day of admission to the hospital. Before admission she had been severely ill for three weeks. Early attempts to induce labor medically and instrumentally had failed, and her condition was hopeless at the time of admission. Another case (Case 8) was not diagnosed at the time of admission, and an attempt to induce labor was made in the hospital before the extrauterine pregnancy was diagnosed. Following the diagnosis an operation was performed. In this case the attempt to induce labor did no harm, as the physician found the cervix too tight to permit introduction of a Voorhees' bag. One patient (No. 12) had received various treatments before she was referred to the hospital, but no accurate history of what had been done was obtainable. She was tentatively diagnosed on admission as having an extrauterine pregnancy, but developed a *B. Welchii* infection before the diagnosis was positive.

It seems probable that at least three of these patients (Cases 1, 7, 12) might have survived if they had entered the hospital earlier, and before they had been subjected to attempts to induce labor. The mortality rate for patients with late extrauterine pregnancy can be decidedly decreased if early diagnosis is made and meddlesome interference avoided.

Each new case of extrauterine pregnancy presents new problems in diagnosis and treatment. The management of the placenta in late extrauterine pregnancy is unquestionably an important factor in determining maternal mortality. Beck, 1919, advocated that the placenta be left in situ in abdominal pregnancy if its blood supply could not be easily ligated. He also advised closure of the abdominal wound without drainage in these cases. He had proved experimentally in animals that a normal placenta can be absorbed from the peritoneal cavity without harmful results to the animal. Since the publication of Beck's paper, it has become an accepted practice to leave the placenta whenever its removal can cause hemorrhage or other difficulties, and to close the abdomen without drainage. The use of this procedure has reduced the mortality associated with these cases. Case 4 in our series illustrates the excellent results, without development of further complications one may obtain with this treatment.

TABLE IV. MORTALITY FOLLOWING DIFFERENT MANAGEMENTS OF PLACENTA

PROCEDURE	NO. CASES	NO. DEATHS	MORTALITY RATE
Placenta removed in toto	3	1	33.33
Placenta removed partially, marsupialization	3	0	0
Placenta left, marsupialization	1	1	100
Placenta left, abdomen closed	5	1	20

Two of the patients (Cases 8 and 12) in whom the placenta was left and the abdomen closed later developed drainage from the abdominal incision. One patient (Case 8) had an elevation of temperature after operation, but the abdominal incision healed by primary union. Later a sinus developed in the lower portion of her abdominal wound. She then went home against advice, attempted suicide at home by poisoning, and was later confined in a mental institution. She was re-admitted to St. Philip Hospital three months after delivery and died four days later. This death should not be charged to the extrauterine pregnancy, since the suicidal drugs she took may have been harmful and her mental condition prevented proper nutrition and management of her case.

Case 11 illustrates one of the dangers encountered when the placenta cannot be removed. This patient's placenta was attached to the rectum, the ileum, the uterus, and the broad ligament. The placenta was left and the abdomen closed. Her abdominal incision healed by primary union, but ten days after the operation drainage occurred from the lower portion of the incision; cultures from the exudate were positive for *B. coli*. Whenever the placenta is attached to the intestine, the danger of infection and suppuration is increased. This should not prevent one from leaving the placenta and closing the abdomen without drainage, but it necessitates a careful follow-up of the patient so that drainage can be established if necessary. A second operation on these patients for removal of the placenta has been suggested by some writers. We doubt the necessity for and the wisdom of such an operation except in very rare cases. Case 11 illustrates the results one may obtain with conservative treatment even if the placenta is not absorbed and there is drainage from the abdominal incision.

In two cases in which the babies were alive at the time of operation and the placenta was left in situ, positive Friedman tests were obtained on specimens of urine from the patients for thirty-five days after operation.

When an operation is performed for an abdominal pregnancy careful incision in the anterior abdominal wall should be made. The operator should avoid any attempt to separate the fetal sac and to remove the placenta until he is reasonably sure the blood vessels supplying the placenta and the sac can be

easily ligated. The use of coagulants now available may enable one to control a moderate amount of oozing but this procedure may not overcome more extensive hemorrhage.

The use of penicillin and sulfa drugs may prevent or decrease infection in the placenta when it is attached to the intestine and left in situ and the abdomen is closed without drainage. The more frequent use of transfusions since the establishment of blood banks has decreased the maternal mortality rate associated with operation for abdominal pregnancy.

### Summary and Conclusions

1. Observations on 13 cases of extrauterine pregnancy of twenty-eight weeks' or more duration have been presented, together with a review of 249 cases reported in the literature since 1933. The maternal mortality in the 12 operated upon was 25 per cent including that of a mother who left the hospital and died three months after operation. The maternal mortality for all 13 cases was 30.76 per cent including one woman who died undelivered.

2. A history of lower abdominal pain persisting since the onset of pregnancy or soon thereafter, accompanied by indigestion, constipation and sometimes irregular vaginal bleeding suggests an extrauterine pregnancy. The absence of uterine contractions when the fetus is palpated, a transverse or abnormal position of the fetus, a firm, long cervix, and a small empty uterus confirm the diagnosis. Roentgen examination of the abdomen and hysterosalpingograms were valuable aids in confirming the diagnosis.

3. An extrauterine fetus can remain viable and continue to grow after repeated episodes of uterine bleeding.

4. Regular rhythmical uterine contractions were observed in a patient with an extrauterine pregnancy.

5. The treatment for each case must be individualized. The placenta should be left in situ and the abdomen closed without drainage whenever removal of the placenta may cause hemorrhage or damage to a vital organ. Removal of the placenta should be reserved for those cases in which the placental blood supply can be easily tied off and the placenta is not attached to a vital organ.

6. The placenta can be absorbed from its attachment in the peritoneal cavity without causing elevation of temperature or adhesions in the pelvic cavity.

7. When the placenta is left in situ, positive Friedman tests have been obtained on urine from the patient thirty-five days after operation.

8. Transfusions of whole blood and the use of new coagulants may be life-saving measures in combatting hemorrhage at the time of operation.

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### Discussion

DR. SAMUEL A. COSGROVE, Jersey City, N. J.—Dr. Ware would appear to have had the good fortune of an uniquely extensive personal experience in the subject of his presentation. I have seen and operated on only three such cases in thirty-four years of direction of a large service, he four times that number in one-half that time.

The relatively large number of these cases coming to his clinic would appear to connote in the locality served by him either or both of the following conditions: first, that the clientele that they derive from do not seek medical advice early in abnormal pregnancy, or, second, that the type of medical service they do seek fails to recognize and properly treat those early abnormalities which lead to late extrauterine pregnancy. There is apparently much room indicated here for a double-barreled program of education designed to reach both laity and doctors.

Especially is this need for physician education exhibited in those cases improperly manipulated before admission to Dr. Ware's service. Any least appreciation of the conditions suitable for such manipulation would have demonstrated that they were *not* present in these cases, and the attendants would have been at once on their guard.

Dr. Ware's discussion of the symptoms and signs of late ectopic gestation is logical. Careful study of it may be helpful to each of us in relation to recognition of this relatively infrequent condition.

He is to be congratulated on the surgical ingenuity and resource with which he has met extremely varying conditions. He properly insists on the prime necessity for individualization of these cases.

His maternal results are good, in consideration of the handicap against him represented by mismanagement of some of the cases before coming to his hands. I believe his fetal results are unusually good in comparison with other experience.

His present larger series bears out his previous showing that where an entire ectopic mass cannot be definitely isolated, and its pedicle readily dealt with, best results attend leaving the placenta in situ, and closing the abdomen.

DR. LOUIS H. DOUGLASS, BALTIMORE, MD.—Recently in Baltimore we had occasion to look up all the abdominal pregnancies over a twenty-five-year period in all of the hospitals in Baltimore. There were twenty-six such cases, and, fortunately, we were able to get from the Health Department information about all of the viable births during that time. Our total was twenty-six cases in 425,620 live births, or an incidence of 1:16,370. It was sixteen times as high in the Negro race as in the white. I thought this might be interesting, in view of the paper this morning. Our total maternal mortality in this whole series was eight and, peculiarly enough, the rate was the same as Dr. Ware's, 30.77 per cent. In the first twenty years the maternal mortality was 41.7 per cent, whereas in the second twelve years, with the improvement in treatment and care, leaving the placenta in, it fell to 21.4 per cent. Our fetal mortality was 77 per cent.

I would like to stress one thing that Dr. Wade mentioned, and this is so self-evident that little is said about it; that is, that in many of the cases where the condition is suspected, we can rule out abdominal pregnancy by putting our hands on the mass. If Braxton Hicks' contractions are felt, the pregnancy is in the uterus.

There was one rather interesting case in our group. The patient was in a hospital in Baltimore in 1931 with a diagnosis of cirrhosis of the liver and ascites. She was a chronic alcoholic. Large amounts of fluid were withdrawn and it promptly filled up again. She signed a release, went home, apparently recovered, and came in to see us in 1934, pregnant. She was delivered spontaneously at full term. The day she was to leave the hospital we had a flat plate of the abdomen made, which showed a mass of fetal bones in the pelvis, so that her "cirrhosis" of the liver in 1931 had been an abdominal pregnancy. She refused operation and said she would keep the fetal skeleton since she had had it so long. We finally found this patient in 1946. She was still living and an x-ray showed that she still had the fetal skeleton in the pelvis.

DR. WILBUR E. HOFFMAN, Charleston, W. Va.—The first case of abdominal pregnancy I saw was when I was resident at the University of Maryland Hospital. This was a Negro girl; and we could not hear a fetal heart beat. One man on the service said he heard it, however. Dr. Douglass and I operated on this patient. When the placenta was removed the patient bled to death on the table. Since then I have seen only three cases in my private practice. Of the three, we obtained two living babies. We left the placenta intact in these three cases and they all recovered.

One factor concerning the diagnosis of these cases will be found very true by watching—all I have seen have been after eight months' gestation. If an x-ray is taken on admission and another in a week or ten days, it will be found that the baby has not changed position at all. In intrauterine pregnancy a change in position of these babies may be found.

DR. WARE (Closing).—One of the patients operated upon because of an abdominal pregnancy was delivered of a normal living baby. The placenta was left in situ and the abdomen closed without drainage. This patient's temperature remained normal, but a mass which we thought was the placenta was palpable in the lower abdomen and pelvis for six months. Two years later she was delivered by cesarean section of a normal intrauterine pregnancy. Careful examination of her peritoneal cavity revealed only a small adhesion of the omentum to the middle third of the right Fallopian tube. No other adhesions were found.

## THE TREATMENT OF PELVIC ENDOMETRIOSIS

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Mercy Hospital Clinics)

THE treatment of pelvic endometriosis is either radical or conservative. The complete destruction or removal of all ovarian tissue results in regression of the ectopic endometriomas, but, inasmuch as most women suffering with this condition are in the childbearing period, this is a costly price to pay. If conservatism could be practiced without serious secondary procedures being necessary in case of failure, then the radical treatment could be reserved for women at or near the menopause. In our clinic this has been the aim. We have now 130 cases treated with this intent: namely, to preserve ovarian function if possible and permit childbearing. Lesions of the uterus designated adenomyoma or adenomyosis have been excluded in this study because they occur in later years. Adenomyosis belongs definitely in the second half of the generative period, while endometriosis occurs in women at the height of their sex life. Dreyfus<sup>4</sup> believes that the two conditions have a different origin because of the rarity of the combination of the two. The etiology of endometriosis is still unsolved but the hypotheses of Sampson,<sup>22</sup> Meyer,<sup>15</sup> Novak,<sup>17</sup> and Halban<sup>8</sup> are most widely accepted.

### Material

Four methods of treatment have been employed in the handling of our cases. The group of 130 is, therefore, divided in Table I according to the treatment used in each case. A few cases were treated by as many as three methods before complete relief was obtained. It is for this reason that the tables showing type of treatment show more therapeutic procedures than we had cases.

TABLE I. PELVIC ENDOMETRIOSIS, 1941 TO 1946

Surgical group	57	43.9
Irradiation group	17	8.3
Hormone group	18	13.9
Untreated	25	19.3
Inconclusive	19	14.6
Total	130	100.0

The follow-up of this group is from one to four years in all but the 19 cases listed as inconclusive. These patients could not be traced and, therefore, are excluded. Periodic examinations are still being done on the remainder. Until they have all passed through the menopause, one cannot draw final conclusions. We feel, however, that enough data has accumulated to warrant this report.

Read at the Fifty-Eighth Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Hot Springs, Va., Sept. 4 to 6, 1947.

**Age**

The average age of the 130 cases is 32.6 years, which is lower than the age given by Counseller,<sup>3</sup> Haydan,<sup>9</sup> Allen,<sup>2</sup> and others. Table II gives the average age for each of the groups in Table I.

TABLE II. AVERAGE AGE OF PATIENTS WITH ENDOMETRIOSIS

Surgical group	32.1
Irradiation group	36.5
Hormone group	29.3
Untreated group	33.6
Average age	32.6

The age of the patient definitely influences the choice of therapy. The older patient is best treated by radical means, as conservative treatment cannot be of sufficient benefit to risk the necessity of secondary therapy.

**Surgical Group**

Fifty-seven, or 43.9 per cent of the 130 patients were treated by surgical means. This is by far the most satisfactory form of treatment because it permits a careful inspection of the peritoneal cavity and microscopic confirmation of the diagnosis. Table III divides this group into those treated by radical surgery (removal of both ovaries with or without hysterectomy) and conservative surgery (preservation of ovarian tissue).

TABLE III. ENDOMETRIOSIS CASES TREATED BY SURGERY

	COMPLETE RELIEF	PARTIAL RELIEF	NO RELIEF	TOTAL	PER CENT
Radical surgery	10			10	17.6
Conservative surgery	25	12	10	47	82.4
Secondary surgery	0	1	3	4*	7.0
Secondary irradiation	0	11	7	18	31.5
Pregnancies	9	2		11	23.6
(11 babies)(1 after x-ray) (1 before x-ray)					

\*One patient expired after closure of colostomy.

The group treated by removal of all ovarian tissue averaged 35.5 years. The disease was so widespread it was thought unwise to temporize. All recovered. Forty-seven patients were treated by conservative measures such as unilateral oophorectomy, resection of an ovary or both, cautery or resection of implants, and uterine suspension to prevent recurrence of adhesions in the cul-de-sac. Only two patients had resection of the presacral ganglion, as this is more effective in adenomyosis than endometriosis. The average age of this group was 30.6 years. Twenty-five have been completely relieved and nine of the twenty-five conceived and bore eleven infants. One was a stillborn due to abruptio placentae. Twelve patients received temporary relief of from one to four years, one had further surgery, and eleven had to have subsequent x-ray therapy because of increasing discomfort. Two of the eleven became pregnant and gave birth to living infants. The one patient, four years after delivery, had to have a permanent castration by x-ray, but is very happy with her only child and feels that the conservative surgery was very worth while. The other patient had recurring symptoms after one year and was given a temporary x-ray menolysis after which she conceived and carried to term. The remaining ten cases treated by conservative surgical means had no relief and were then retreated surgically in three instances and by x-ray in seven. Of those retreated by surgical means, three had bowel invasion with definite constriction. One

patient had a colostomy at the first operation and, after microscopic confirmation that the lesion was benign, was castrated by means of x-rays. Resolution was satisfactory, but the patient expired at a later attempt to close the colostomy. It is our observation that patients with rectal invasion respond satisfactorily to castrating doses of x-ray, therefore surgical resection which is dangerous is not necessary. The eleven pregnancies, an incidence of 23.6 per cent, we feel, justifies the conservative treatment, as most of these patients gave sterility as one of their major complaints. Seven of the forty-seven patients were single, so the actual incidence of conception rises to 27.5 per cent.

TABLE IV. ENDOMETRIOSIS CASES TREATED BY IRRADIATION

	COMPLETE RELIEF	PARTIAL RELIEF	NO RELIEF	TOTAL	AVERAGE AGE
Permanent menolysis	17			17	36
Temporary menolysis	12			12	31.3
Secondary irradiation		1		1	34
Pregnancies	2			3	
(3 babies)					

In this group of twenty-nine patients, seventeen were given a castration dose of x-ray, and all have remained free of symptoms. Their average age was 36 years. Twelve patients were given a temporary menolysis of from three to eight months' duration and, with the return of the menses, have remained free of their discomfort. This group averaged 31.3 years of age. There will undoubtedly be a high recurrence rate among these patients, but many will have advanced in age sufficiently so that x-ray castration can be used without too much discomfort to the patient. One patient, already mentioned in the discussion of surgical therapy, was treated with x-ray to cause a temporary menolysis after conservative surgery had failed to result in pregnancy. She conceived shortly after this therapy and delivered a normal infant. Four years later her symptoms were again so severe she was castrated with x-ray. The other patient who has delivered twice was referred by Dr. Harold Gainey of this Society, and he has reported on July 19, 1947, that she now has a normal pelvis.

#### Hormonal Therapy

Androgen therapy was used in fifteen cases of this study, the average age for this group being 29.3 years. None of these patients had previous surgery, so that the diagnosis is purely clinical after exclusion of all other conditions. We realize that there may be errors in this group, but agree with Gardner<sup>6</sup> that a clinical diagnosis of endometriosis can be made with a good deal of accuracy. In the future we shall employ culdoscopy as practiced by TeLinde<sup>21</sup> to obtain tissue for microscopic confirmation of the diagnosis. These patients were young with minimal pathology, small nodes or single small cysts, but with definite relationship to the menstrual cycle. It was our aim to carry these patients as long as possible before instituting more severe procedures. One patient conceived during this treatment and has delivered a normal infant.

TABLE V. ENDOMETRIOSIS CASES TREATED BY HORMONES

	COMPLETE RELIEF	PARTIAL RELIEF	NO RELIEF	TOTAL
Androgens	6	8	1	15
Estrogens	1		2	3
Secondary surgery		1	1	2
Secondary irradiation				
Pregnancies	1			1

Six of the group have complete relief of symptoms as long as they continue taking oral testosterone in daily dosage of 10 milligrams. The initial effect was obtained by intramuscular injections of varying dosage as not to cause masculinization of the patient. We have never resorted to the use of testosterone in diffuse endometriosis as advocated by Hirst<sup>11</sup> and Miller,<sup>16</sup> as our preference here is for x-ray therapy. Eight patients have partial relief from this form of therapy and can "carry on" with the residual symptoms. One patient had no relief. Three patients have been treated with estrogens in an attempt to control symptoms by inhibiting ovulation. Two had no relief, but one has taken 5 milligrams of stilbestrol daily for two years and manages quite well. The two who were not benefited have refused surgical treatment which had been advised.

### No Treatment Group

Twenty-five patients have received no therapy for various reasons. Six, who averaged 41.5 years of age, were permitted to enter the menopause. One of these was but 28 years old, an arrested case of pulmonary tuberculosis, who had a functional amenorrhea. Another, 36 years of age, had an early menopause. The remaining four were 44, 45, 47, and 49 years of age. Eight patients who averaged 30 years of age are being watched but not treated because of minimal discomfort and their ages. Eleven patients who averaged 34.8 years of age refused the treatment suggested. Two of the group under observation have conceived and are receiving prenatal care. In this group we again have to rely on clinical diagnosis. It is hoped that all patients can be followed until a final, positive diagnosis is obtained.

TABLE VI. ENDOMETRIOSIS CASES NOT TREATED

Spontaneous menopause	6	41.5 (Age)
Watchful expectancy	8	30.0 (Age)
Refused treatment	11	34.8 (Age)
Pregnancies	2	

Nineteen of the 130 patients have been lost or insufficient data were obtainable to confirm the diagnosis of endometriosis. Although the clinical diagnosis was relied upon in some of the cases included in this series, the evidence had to be convincing and more than one examiner's opinion was obtained.

### Discussion

The incidence of pelvic endometriosis is in the neighborhood of 10 per cent (Meigs,<sup>14</sup> Haydan,<sup>9</sup> Allen,<sup>2</sup> and Fallas and Rosenblum,<sup>5</sup> etc.) which in private material, according to Meigs, is 28 per cent and Holmes finds an incidence of 26 per cent. This incidence is higher than that of pelvic inflammatory disease in private cases. Our own average age of 32.6 years agrees with the findings of Counseller,<sup>3</sup> Payne,<sup>19</sup> and Meigs<sup>14</sup> that the greatest frequency of endometriosis is in the middle third of reproductive life. The associated sterility demands conservative yet intelligent management. Our incidence of conservative therapy (82.4) is higher than in most series reported. Allen,<sup>2</sup> Haydan,<sup>9</sup> Pemberton,<sup>20</sup> and others report conservatism in a lower percentage. Albrecht<sup>1</sup> treated six cases by producing temporary amenorrhea with x-rays when recurrence had taken place following removal of implants at the time of laparotomy. Retrogression was complete and menses recurred. Individualization is necessary in each instance as the age of the patient, her desire for offspring, and the extent and location of the disease influence the decision as to the ideal treatment.

for that particular patient. Forty-six and seven-tenths per cent of our group treated by conservative surgery had secondary therapy. This, we believe, is justifiable because of the 27.5 per cent who conceived and delivered thirteen term infants.

Secondary irradiation proved quite satisfactory, especially when permanent menolysis was achieved. In every instance the dose table of Gauss<sup>7</sup> was adhered to and pelvic measurements were made according to our previously described technique. Careless administration of x-ray will result in undesired results such as castration when temporary menolysis is desired.

Hormone therapy with androgens in young patients with minimal complaints not only corroborates the diagnosis when it subdues the symptoms, but it may enable the physician to carry his patient to an age when more radical treatment would not be so costly. That some patients have pelvic endometriosis without discomfort and that others recover spontaneously has been our observation as well as Gardner's.<sup>6</sup>

The one death in this series resulted from closure of a colostomy which had been performed for partial obstruction due to invasion of the gut by endometrial tissue. The response of this case and others in this series to x-ray or surgical castration causes us to agree with the observation of Heyman<sup>10</sup> that resection or colostomy is unnecessary. As shown by Jenkinson and Brown,<sup>13</sup> the regression following castration relieves the obstruction and further treatment is unnecessary.

### Summary and Conclusion

Pelvic endometriosis occurs most frequently in the childbearing period and is a major cause of sterility. Conservative treatment, which will increase the possibility of conception is, therefore, the most desirable form of therapy.

A review of 130 cases treated with this intent shows that 57 or 43.9 per cent were treated by surgical procedure. Ten, or 17.6 per cent, required radical surgery (removal of both ovaries with or without the uterus). Forty-seven, or 82.4 per cent, had one or both ovaries preserved, and eleven later conceived giving birth to thirteen infants, an incidence of 23.6 per cent or a corrected incidence of 27.5 per cent.

X-ray therapy was employed in twenty-nine cases, of which seventeen were given sufficient dosage to cause a permanent menolysis. Twelve were treated with smaller dosage causing a menolysis of from three to eight months. In this group two conceived and delivered three infants, an incidence of conception of 16.6 per cent. X-ray therapy in this group proved satisfactory for secondary therapy when conservative surgery had failed.

X-ray therapy of sufficient intensity to destroy ovarian function is indicated in cases where endometrial tissue has invaded the bowel or bladder. It obviates the necessity of surgical resection with its increased risk.

Watchful expectancy or male hormone therapy is of value in cases with minimal disease and symptoms in young women. It enables one to postpone more radical procedures to the years when such therapy is less costly.

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25 EAST WASHINGTON STREET

### Discussion

**DR. CLYDE L. RANDALL**, Buffalo, N. Y.—We have recently reviewed our choice of procedure when endometriosis was encountered at laparotomy during the years 1936 to 1945. This study revealed an incidence of endometriosis of only 4.7 per cent among women subjected to laparotomy on the Gynecology service of the Buffalo General Hospital during that ten-year period.

Evaluation of the therapy employed has been based on personal knowledge of the follow-up status of eighty-one patients among 142 cases of endometriosis operated on the Gynecology service of the Buffalo General Hospital during that ten-year period.

A few questions arise in regard to terminology. Dr. Schmitz speaks of the preservation of childbearing capacity as a desirable part of conservative therapy, but I would like to know what proportion of his forty-seven patients "operated conservatively" had a hysterectomy, and the number in which childbearing capacity as well as some ovarian tissue was preserved? I also regret that time did not permit him to report results in greater detail as far as age groups are concerned.

Classifying our treatment in accordance with the essayist's criteria, 86 per cent of 142 women operated upon for endometriosis, 94 per cent of those under 35 years, and 78 per cent of those 35 to 44 years of age, were treated conservatively (since some ovarian tissue was preserved in that proportion of each group). Moreover, childbearing capacity was preserved in 80 per cent of women under 35 years, in 48 per cent of women 35 to 44 years of age, and in only 7 per cent of women over 45 years of age.

Among the group in whom childbearing capacity is preserved, I am sure it is possible to anticipate a higher incidence of pregnancy than is generally realized. Considering women who were not only married but who actually wanted children, we found that 40 per cent had borne one or more after a conservative operation for endometriosis. Incidentally, we might well acknowledge here that the effect of pregnancy upon residual or recurrent endometriosis offers a problem that should justify a study of pooled data. Our observation of only nine cases over a short period of time so far suggests that disappearance of palpable lesions during pregnancy represents temporary and not a permanent regression of the disease.

I suspect Dr. Schmitz' group rarely remove the uterus when operating for this disease, for I would find it difficult to exclude from a review of external endometriosis "those patients with lesions of the uterus designated adenomyoma or adenomysis." At least on our service, when 142 women were operated upon with adnexal endometriosis and the uterus was removed

in sixty-eight, or 47.8 per cent of cases, adenomyosis was reported within the wall of twenty-eight, or 41.2 per cent of those uteri.

Eighty-one operated patients have been followed two to twelve years. Twenty-eight per cent of those operated conservatively have to date been subjected to further treatment because of recurrent endometriosis. It is interesting that Dr. Schmitz thought it necessary to reoperate only four, or 8.5 per cent, of forty-seven patients, whereas he employed irradiation for recurrent disease in an additional eighteen, or 38.3 per cent, of the women originally treated by conservative surgery. I have no reportable experience with patients whose suspected endometriosis has been treated by irradiation alone. Eight of our patients have to date received postoperative irradiation, five for castration, and in three subcastration dosage was employed. We have to date resected endometriomas invading the bowel wall, but I feel the essayist has rightfully emphasized the effectiveness of irradiation under such circumstances.

I am glad to hear correction of a retroversion mentioned as part of a conservative operation for endometriosis. Throughout the ten-year period reviewed we have been convinced of the importance of freeing the uterus from the cul-de-sac and have practiced the method of ovarian bisection and resection recently emphasized by Beecham.

When our clinical diagnosis of endometriosis has not been verified by laparotomy we have to date not attempted to evaluate the course of this disease. While consideration of such cases would provide a desirable control group, until we employ the peritonoscope or culdescope to establish the diagnosis I feel we should give little consideration to unoperated cases.

Obviously, objections to unproved cases also arise when we attempt to evaluate hormone therapy. Occasionally, on a purely symptomatic basis, androgen therapy may be indicated for palliation, but I feel strongly that whenever endometriosis is suspected, its presence should be verified by adequate surgical exploration. Certainly exploration seems justified when we consider the evident effectiveness of conservative surgery in this disease. Androgen therapy may prove its chief usefulness among postoperative patients in whom symptoms or pelvic findings suggest recurrence to a degree that does not seem to warrant castration or reoperation. At least the temporary, symptomatic relief afforded by hormone therapy seems of value when we attempt to convince an apprehensive postoperative patient that she can live with her recurrent disease for a while.

In conclusion, I would like to suggest that "conservative" surgery for endometriosis should imply preservation of childbearing capacity as well as ovarian function, and that we should consider as "radical," treatment that results in castration at any time, or the loss of childbearing capacity under 35 years of age.

DR. CLAYTON T. BEECHAM, Philadelphia, Pa.—Some years ago Dr. Meigs wrote an editorial for *Surgery, Gynecology and Obstetrics* on the occurrence and progress of endometriosis in young women. He found it to be a common lesion in his private practice, as against the ward patients—the latter group bearing children while still young. Meigs felt that the prolonged period of birth control in those of a higher economic level contributed greatly to developing major endometriosis lesions by allowing uninterrupted menses for years. Therefore, if his theory is tenable, pregnancy is a valuable conservative therapeutic measure for endometriosis. In my experience I have found this to be true.

I think all of us should individualize in the light of pelvic findings and keep early endometriosis lesions in mind, whenever we advise contraception. It would seem that early childbearing is a prophylactic against widespread endometriosis in the younger groups.

We have seen many women who have postponed childbearing for any number of reasons, consult us because of severe endometriosis symptoms. In the majority of cases, pregnancy is advised. It is surprising the high percentage of patients who are able to conceive, in spite of marked endometriosis. As gestation progresses it is most satisfying to watch the palpable ectopic endometriosis fade away.

What happens after delivery? A small number will have a return of symptoms three to four months post partum, while others may go many months before they are aware of

their endometriosis. Careful guiding and encouragement of the patient will result usually in more pregnancies. The endometriosis may be subdued for years, or, if uncontrolled, surgery may be undertaken in a patient who has a family.

DR. WILLARD R. COOKE, Galveston, Texas.—Dr. Schmitz made no mention of a procedure which I have found most valuable in the treatment of pelvic endometriosis—so valuable, in fact, that since 1932 I have not performed radical extirpation in any case. This procedure is presacral sympathectomy and, where indicated, ovarian neurotomy. While I have at present no idea of the total number of cases in which these procedures were carried out, I have a complete follow-up on seven cases of massive endometriosis. These cases were all of the type in which the pelvic viscera were indistinguishably merged, upon vaginal examination, into a mass filling the pelvic cavity. Not only was the symptom of pain relieved, but there has been a complete or almost complete disappearance of the mass in every case, and two of the patients have since borne three children.

I feel that the semidisrepute into which these operations have fallen is due to two misconceptions, one anatomic, the other technical. It is useless to expect relief of pain in areas which lie outside the sensory distribution of the presacral plexus. This is particularly true of the ovaries, whose sensory nerve supply is entirely different and must be interrupted if relief of ovarian pain is to be secured. For instance, in one of the cases referred to above it was necessary to warn the patient that the pain due to an area of endometriosis overlying the right ureter above the pelvic brim would not be relieved. The second misconception is in regard to the technique of adequate excision of the presacral plexus. It is commonly stated that only the tissues anterior to the plane of the middle sacral vessels need be removed. This is far from true, since many of the fibers of the plexus pass posteriorly as well as anteriorly to the femoral vessels and the plexus itself is very widely distributed throughout the tissues anterior to the spine. We have found it possible to interrupt all of the essential fibers only by using the mesial surface of the femoral veins as a guide to the removal of the entire bloc of tissue between these vessels all the way down to the periosteum and ligaments of the under lying spine and/or sacrum for a vertical distance of at least three centimeters.

DR. G. D. ROYSTON, St. Louis, Mo.—There are two points I should like to mention. The first is the findings of inflammation without infection are suggestive of endometriosis. The second is the difficulty of making a differential diagnosis by means of the x-ray of malignancy from endometriosis involving the lower bowel wall.

DR. SCHMITZ (Closing).—I am sorry that offhand I cannot tell Dr. Randall the percentage of these patients who had hysterectomy. None of the conservative group did have hysterectomy. As I defined conservatism, I said preservation of the uterus and some ovarian tissue.

This question of birth control is of great importance as far as endometriosis is concerned. It is brought out again that these patients are in the middle third of their reproductive life with the complaint of sterility. Had they conceived early in their reproductive life they may not have suffered from endometriosis.

In answer to Dr. Cooke, I have included presacral sympathectomy. I said that it is of value in adenomyosis, but not in pelvic endometriosis.

In using androgen the dosage varies. We use sufficient dosage to control the symptoms, then try to find a clinical dose that will control the condition.

## FIFTY-FOUR DEATHS OCCURRING IN PREGNANT PATIENTS WHO HAD HYPERTENSION\*

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THE material for this presentation was obtained from an analysis of the Duke Hospital charts and records of fifty-four patients who had blood pressure elevated above 140/90, and who died during pregnancy or in the immediate puerperium. The only selection of patients was the exclusion of thirty-five deaths of eclamptic patients. These were recently reported elsewhere.

We began this analysis by asking some of the questions about hypertensive pregnant women which we would like to have answered. We wanted to know more of their history and prenatal care, more of the important physical findings and associated complicating conditions. We wanted to find out what, if any, laboratory data are significant. We were interested in the labor and delivery of these patients, and finally in their mode of death.

We have approached the problem from the standpoint of patients who died due to failures of management. The fault may have been the patient's, the physician's, or the result of circumstances beyond the control of either.

The purposes of this study were twofold: first, to select facts from the records which will assist us to better estimate the prognosis of similar patients in the future. Second, to analyze our method of management for information which can guide our future therapeutic approach to such patients.

The problem of hypertension and pregnancy has received considerable attention in the past seven years. There is a large variation in the attitude of the authors<sup>1, 2, 3, 4, 7, 13, 16</sup> whom we have consulted. We believe our analysis is justified by the statement in 1942, of Hamilton and Thompson,<sup>7</sup> that further study is needed in order to establish any definite rules for the management of the pregnant woman with hypertension.

Table I presents the distribution of deaths by years. The steady increase in the relative importance of the hypertensive pregnant patient as a cause for maternal mortality is in keeping with the increase in chronic vascular renal disease as a cause of death in the general population.

TABLE I. YEARLY DISTRIBUTION

YEARS	DELIVERIES	TOTAL MATERNAL DEATHS	DEATHS WITH HYPERTENSION	PER CENT OF TOTAL DEATHS
1931-1936	1,564	85	17	20
1937-1941	3,302	72	20	28
1942-1946	6,101	49	17	35
Total	10,967	206	54	

\*Presented at the Fifty-Eighth Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Hot Springs, Va., Sept. 4 to 6, 1947.

Table II shows the frequency with which previous hypertension could be diagnosed from the records of our group of patients. Since most were seen first in the last trimester of pregnancy, it was impossible to answer this question very accurately. We believe that most, if not all, of the fifty-four patients had previous hypertension at some time. We do not think it is absolutely necessary to differentiate hypertensive disease and late pre-eclamptic toxemia of pregnancy. In fact, we believe it may be impossible to do so late in pregnancy.

TABLE II. PREVIOUS HYPERTENSION

TOTAL PATIENTS	PREVIOUS HYPERTENSION NOT ASSOCIATED WITH PREGNANCY	HYPERTENSION WITH PREVIOUS PREGNANCY	INADEQUATE HISTORY
54	19	21	25

The age distribution of the fifty-four patients is given in Table III. Most of them were 30 years of age or over, which would be expected of patients with hypertensive disease.

TABLE III. AGE DISTRIBUTION

15-20	21-25	26-30	31-35	36-40	41-45	46-50	TOTAL
1	3	10	15	14	9	2	54

Forty-five of the fifty-four were multiparas. There were 29 Negroes and 25 white women in our group. Our delivery ratio of white to Negro is about eight to five. Except for two patients treated when the hospital first opened, all of this group were public ward patients. An estimate of their prenatal care is given in Table IV.

TABLE IV. ESTIMATE OF PRENATAL CARE

NO CARE HERE	ADEQUATE CARE OUTSIDE	PREGNATAL CARE HERE
48	2	7

The average number of previous pregnancies for the group was 5.8; the average number of living children was 4.6 (Table V). The fate of the infant is a most important consideration in any pregnancy, and particularly so in pregnancies involving such sacrifices as those we are studying. Only seventeen of the fifty-eight infants survived the neonatal period, which is not a fair ratio for the investment of fifty-four (maternal) lives.

TABLE V. YEARLY DISTRIBUTION OF STILLBIRTHS AND NEONATAL DEATHS

YEARS	TOTAL	INFANTS OF PTS. WITH HYPERTENSION	% OF TOTAL
1931-1936	205	13	6
1937-1941	336	16	5
1942-1946	386	12	3
Total	927	41	

In our group, postmortem section was done four times without obtaining a living baby. We do not consider this a very worth-while procedure.

Browne and Dodds,<sup>15</sup> in reporting 222 pregnant women with chronic hypertension, noted that when the diastolic pressure was 100 or more there was only

a 31.5 per cent chance for a living infant. In our group, fifteen of the sixteen patients whose infants survived had diastolic pressure greater than 100. Six pressures were 120 or greater.

TABLE VI. WEIGHTS (GM.) OF LIVING CHILDREN

1400-1500	1600-1900	2000-2500	2600-3000	3100-3500	3600-4000	TOTAL
1	0	4	7	4	1	17

The average admission diastolic blood pressures for the group are presented in Table VII. The elevated blood pressure was the one common denominator of all the patients. Other points varied a great deal and made it impossible to classify all of them as to the exact pathologic process. We want to reiterate here that we are discussing hypertensive pregnant women. We cannot be sure how much pre-eclampsia, nephritis, or essential hypertension they had. In our study, we have learned that no single factor is of too much practical importance, because management should depend on the seriousness of the whole clinical picture.

TABLE VII. AVERAGE ADMISSION DIASTOLIC BLOOD PRESSURE

90-99	100-110	111-120	121-130	131-140	141 OR ABOVE
6	15	10	7	5	11

We have not recorded systolic pressures because their variability makes them of less value than the diastolic readings. It is felt by some authors<sup>5</sup> that the pathologic process continues although the blood pressure has been greatly reduced. Goldring and Chasis<sup>5</sup> have emphasized the futility of treatments directed only toward bringing down the blood pressure level.

In Table VIII an analysis of the changes found in the optic fundi is presented. These changes consisted of thinning of the vessels, increased light reflex, tortuosity of the vessels, A-V nicking, and in a few instances hemorrhages and exudates. Different opinions have recently been expressed about the value of the optic fundi as an estimate of prognosis in hypertensive cardiovascular renal disease. Hallum<sup>6</sup> has emphasized their importance to the obstetrician. Goldring and Chasis<sup>5</sup> have called attention to the frequent discrepancy between the height of the diastolic pressure and the extent of the arteriolar disease, as manifested in the retinas. They state that the fundi of patients with malignant nephrosclerosis may show few abnormalities, while extreme ocular changes are sometimes rested in patients who actually have benign hypertension. In our experience, the ocular changes were a relatively constant finding in these patients with a lethal exodus.

TABLE VIII. CHANGES IN OPTIC FUNDI

DEFINITE	NO CHANGES	NOT WELL VISUALIZED
38	5	11

Hamilton and Thompson<sup>7</sup> have suggested that a grossly enlarged heart adds greatly to the risk of pregnancy for hypertensive individuals. Hearts weighing 400 Gm. or more were found at autopsy in fourteen of the group. The estimation of heart size in the other patients were made clinically and by x-ray. A total of twenty-five patients were thought to have enlarged hearts.

It is common knowledge that obesity adds to the hazards of hypertensive disease. In our series, thirty-three of forty-six patients were definitely over-

weight. The state of nourishment of eight patients was not recorded. These figures are certainly suggestive of an association between the two conditions in the pregnant woman.

The laboratory findings in hypertensive disease are seldom significant in the earlier stages. Whenever there are urinary changes, the prognosis is more serious. This was confirmed in our series of patients. Of fifty-one urine examinations, only seven were negative. In four of these, the hypertension was entirely secondary. The urine changes always included albuminuria, frequently cylindruria, and almost never hematuria.

Some blood chemistry findings are listed in Table IX. It is interesting that two total protein values were low (below six) with a normal A/G ratio, and five A/G ratio values were below one, whereas the corresponding total proteins were normal (six or above). The frequent alterations in plasma proteins may be due to the fact that our patients were malnourished. In this connection, twenty of fifty-three patients examined had lowered hemoglobin values (below 70 per cent). In only six of these patients was the low value associated with excess blood loss.

TABLE IX. BLOOD CHEMISTRY FINDINGS

	URIC ACID	PLASMA PROTEINS	A/G RATIO
Total obtained	43	22	21
Normal	8	7	4
High (4.0 mg. or more)	35	-	-
Below 6 Gm.	-	15	-
Below 1	-	-	17

The great frequency of elevated uric acid values among our patients is possibly significant. Chesley and his associates<sup>2</sup> have recently stated that the development of toxemia of pregnancy in patients who are already hypertensive is the really serious complication and hazard to their lives. The almost constant occurrence of urine changes and high blood uric acid values strongly suggests that most of our patients were suffering from hypertensive cardiovascular renal disease and superimposed pre-eclamptic toxemia.

An electrocardiogram was obtained on fourteen patients. In nine of these some sort of abnormality was reported. However, only in two patients was a definite diagnosis, auricular flutter, made. The other changes included left axis deviation and T-wave alterations.

The proper management of the pregnant patient with hypertension requires a great deal of judgment. It is difficult to decide when, and if, the pregnancy should be interrupted. In our study we have found that no set rules of management were followed. The decisions were individualized. Our observations on these patients merely show what happened to them. We can possibly draw conclusions from some of these occurrences.

Table X records the hospital days before delivery and death. The high number who died before the fourth day may indicate the seriousness of their condition on admission. The fact that one-half the group delivered in three days indicates early intervention, but the fact that nine patients died undelivered suggests a conservative attitude.

TABLE X. DAYS BEFORE DELIVERY AND DEATH

HOSPITAL DAYS BEFORE DELIVERY				NOT DELIVERED	HOSPITAL DAYS BEFORE DEATH				
0-3	4-6	7-10	11 or more		0-3	4-6	7-10	11-14	15 or more
27	11	5	2	9	19	11	10	6	8

An analysis of the labor and delivery of the fifty-four patients is presented in Table XI. Seven deaths following therapeutic abortion seems a high one when we recall that these were the results of efforts to relieve the patient of an early pregnancy. This treatment may be considered worse than the disease.

TABLE XI. GROSS ANALYSIS OF LABOR AND DELIVERY

THERAPEUTIC ABORTIONS	SPONTANEOUS LABOR	INDUCED LABOR	NOT DELIVERED	SPONT. VAG. DELIVERY	OPERATIVE VAG. DEL.	ABDOMINAL DELIVERY
7	22	16	9	19 (outside)	13 (outside)	6

Table XII gives supplementary information about the therapeutic abortions which is necessary to fully appreciate the statistics of Table XI.

TABLE XII. TYPES OF THERAPEUTIC ABORTIONS (FETUS LESS THAN 1000 GM.)

1	Aborted outside (D and C for bleeding)
1	D and C (two-month size uterus). Uterus ruptured. Supravaginal hysterectomy
1	Artificial rupture of membranes at five and one-half months
1	Vaginal hysterotomy (700 Gm. fetus)
2	Abdominal hysterotomy and tubal resection (3 to 4 months)
1	Supravaginal hysterectomy (3 to 4 months pregnant)
7	

Table XIII presented an analysis of the cesarean section done on this group of patients. Three of these patients died of causes directly related to the hypertensive cardiovascular renal disease.

TABLE XIII. SECTIONS AND CAUSE OF DEATH

TYPE OF SECTION	SHOCK DUE TO RUPTURE OF UTERUS	SHOCK WITHOUT EXCESS BLOOD LOSS	CONGESTIVE HEART FAILURE	UREMIA	EMPYEMA AND CHRONIC NEPHRITIS	DEHISCENCE AND PERITONITIS
Classical without labor (4)	-	1	-	1	1	1
Classical with 4 hr. labor (1)	-	-	1	-	-	-
Porro (Rupture of uterus after 7 hr. labor)	1	-	-	-	-	-

The results of induced labor are compared with spontaneous labor (Table XIV).

TABLE XIV. COMPARISON OF LABOR WITH DELIVERY

TYPE OF LABOR	OPERATIVE VAGINAL DELIVERY	SPONTANEOUS VAGINAL DELIVERY	ABDOMINAL DELIVERY	DIED UNDELIVERED
Medically induced (4)		4		
Surgically induced (12)	6	4		2
Spontaneous (22)	7	12	2	1

One of the most interesting parts of this study was the effort to catalogue the patients as to the immediate mode of cause of death.

Table XV presents an analysis of these figures which is self-explanatory. Some of these patients received more attention than others. We have presented the autopsy and medical consultation figures because they afford some idea of the

TABLE XV. ANALYSIS OF CAUSE OF DEATH

	CON- GESTIVE HEART FAILURE	UREMIA	CEREBRO- VASCULAR ACCIDENT	SHOCK WITHOUT EXCESS BLOOD LOSS	AR- RHYTH- MIA	HYPER- TENSION CON- SIDERED SECOND- ARY	TOTAL
Number in each group	14	8	3	12	1	16	54
Grossly enlarged hearts	10	4	2	6	1	2	25
Medical consultation	13	4	3	5	1	6	32
Autopsies	10	4	0	6	1	9	30

sort of study given them. The relative frequency of definitely enlarged hearts corresponds well with the severity of the vascular disease.

Tables XVI and XVII are presented figures to support the initial classification of the cause of death. It is fitting to remark here that the classification of death causes is a personal one. We readily admit that variations in the categories would almost certainly result if any other observers attempted to classify them. However, we think our classification affords an opportunity to study more adequately the course of hypertensive cardiovascular renal disease in the pregnant patient. Probably the most unexpected finding was the large number of patients who died in circulatory collapse. The blood pressure changes were always accompanied by cold moist skin and rapid thready pulse. The pressures fell very quickly from diastolic levels between 120 and 170 to an average of 50 to 60. No patient was included in this group in which the blood loss was excessive.

TABLE XVI. ANALYSIS OF THE UREMIA GROUP

	800	1000	1900	700	170	1500	165	1000
Output (c.c.)	↓	↓	↓	±	↓	↓	↓	↓
	200	450	740		40	150	0	0
Nonprotein nitrogen (mg.)	53	33	54	61	64	48	28	35
	↓	↓	↓	↓	↓	↓	↓	↓
	84	211	72	105	165	83	54	105

TABLE XVII. SIGNIFICANT DIAGNOSES HYPERTENSION SECONDARY GROUP

3	Pulmonary embolus
4	Puerperal endometritis
3	Rupture of uterus
1	Empyema
3	Placenta previa and premature separation (severe blood loss)
1	Indefinite
1	Anesthetic death (large goiter)
16	

As a result of this finding, an effort was made to locate references in the literature that hypertensive patients are more subject to, and tolerate less well, peripheral circulatory collapse. Moon<sup>8</sup> refers to shock in toxemia of pregnancy. Adair and his associates reported an increased incidence of shock in toxemia patients. A careful study of their patients suggests that many had pre-existing hypertensive disease, complicated by toxemia. In fifteen of their sixteen severe patients, the optic fundi showed definite evidence of chronic vascular disease. The appearance of shock in pregnant nephritis and eclamptic patients has been noted by others.<sup>10, 11, 14</sup>

No conclusive reference to shock in hypertensive patients was found in the literature. There is nothing to indicate that the operative procedures incident to labor and delivery are accompanied by more circulatory collapse in hyperten-

sive than in the normal patients. On the other hand, Lash<sup>12</sup> has recently stated, "We have already learned that hypertension without serious cardiac complication does not add much to the hazards of operation."

We have previously remarked in this analysis that most of our patients had evidence of pre-eclamptic toxemia as well as hypertensive disease. It may be that the frequency of shock in our group depends partly on the combination of conditions.

In Table XVIII, we have analyzed the labors and deliveries of our patients according to their mode of death. We have been looking for elements of operative trauma and have found more interference in the hypertension secondary group than in the others. This may indicate that in the "shock group" the circulatory collapse may have some other basis than "interference." Eight of the forty-five patients who were delivered had labor lasting longer than twenty hours and four longer than thirty hours. Eight patients had ether, one caudal, one spinal, ten local, and the remainder had no anesthesia.

TABLE XVIII. COMPARISON OF LABOR AND DELIVERY WITH MODE OF DEATH

MODE OF DEATH	SPONTANEOUS LABOR	INDUCED LABOR	UNDELIVERED	SPONT. VAG. DELIV- ERY	LOW FOR- CEPS DELIV- ERY	OTHER OPERA- TIVE VAG. DELIV- ERY	ABDOMI- NAL DELIV- ERY	THERA- PEUTIC ABOR- TIONS
Congestive failure (14)	8	1	5	4	4		1	
Shock without excess blood loss (12)	6	3		4		4	1	3
Uremia (8)	4	3	1	6			1	
Cerebrovascular accident		2		2				1
Hypertension secondary (16)	3	7	3	2		5	3	3
Arrhythmia (1)	1			1				
Totals	22	16	9	19	4	9	6	7

### Summary and Conclusions

1. The increasing problem of hypertension reflects itself in the pregnant female, especially in the colored patient.
2. The difficulty of accurately classifying toxemias of pregnancy even after autopsy is evident.
3. The ratio of living infants to dead mothers is recorded.
4. The elevated diastolic blood pressure was the common denominator of all fifty-four patients.
5. We believe that help from all consultant's sources is important and the simpler laboratory tests are worth while.
6. The hypertensive woman with enlarged heart, changes in the optic fundi, and albuminuria has a poor prognosis when pregnant. Serious consideration of interruption by the most conservative means should be given such patients, regardless of the stage of pregnancy, and contraceptive measures should be suggested.

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### Discussion

DR. J. BAY JACOBS, Washington, D. C.—The worth-while purpose of this study has been stated, namely, to better estimate prognosis and to arrive at an effective form of treatment. However, the clinical material is of such type as to make it difficult to obtain proper evaluations. The majority of these patients had had little or no prenatal care; the incidence of occurrence in Negro and white is almost two to 1; and all of the patients died after very short hospitalization. It is evident that there was very little opportunity on the part of the clinicians to treat the condition much before death. For such reasons, I would state that probably none of these patients died due to failures of management.

We are told that eclampsia has been eliminated from this study, and at the same time the essayist emphasizes that he cannot be sure of how much toxemia, nephritis, or essential hypertension existed. Such hypertensive patients are probably very prone to the development of toxemia of pregnancy, and so perhaps the inclusion of eclampsia in such a study might be desirable.

I think we all agree with the essayist in emphasizing the importance of high diastolic pressure as one means for selecting these cases. I note also that he has a tendency to ignore high systolic pressure. Since most practitioners have learned to detect toxemia early because of elevated systolic pressure, resulting of course in lowered mortality due to toxemia, I would hesitate very much to publish this view because of the possible ill-effect upon men who are not experienced enough to evaluate published matter and who would be inclined to follow such views, especially since they emanate from a well-recognized clinic.

Since the desire to obtain a living infant is of paramount importance in any obstetric case, it is well to note that fifteen of the sixteen patients whose infants survived had diastolic pressures greater than 100 in this series, as compared to Browne and Dodds who reported only a 31.5 per cent chance for living infant in a series of 222 pregnant women with chronic hypertension. Perhaps this difference is due to the fact that the essayist advocates individual treatment for such cases, with what appears to be a tendency toward conservatism.

I would like to state a few facts and practical suggestions made by Dieckmann in the *Surgical Clinics of North America* (February, 1943). It should be remembered, however, that he is referring to hypertensive toxemia of pregnancy and not to an analysis of such deaths. He states that 5 per cent of all pregnant women delivered in hospitals in the United States have some evidence of toxemia, and that one-half of them have permanent vascular disease as a basis for the condition. He offers certain advice for the treatment of such patients both for their benefit and that of the infant, presuming of course that the patient is of high enough mentality to seek medical advice earlier in pregnancy.

Since such patients are known to have small babies, he has advocated the administration of 500 c.c. of 20 per cent glucose intravenously three times a day for a week at a

time as well as encouraging the patient to eat hard candy throughout pregnancy in order to help increase the size of the fetus. Since fetal death in these cases is frequently caused by abruptio placenta, retroplacental hematoma, or placental infarction, and since they all have the same etiology and are said to be amenable to treatment with vitamin E, such therapy may be worth trying, throughout pregnancy or at least after the twenty-fourth week.

Most of these women are fat and remain so in spite of thyroid medication, and for that reason their intake is kept at 2,000 calories, limiting fat intake and allowing 80 to 100 Gm. of proteins daily as well as a quart of skimmed milk. The importance of ample bed rest throughout pregnancy is emphasized.

Dieckmann states that his results indicate that the careful medical management of the toxemic patient, if begun early enough, will usually prevent further increase in the severity of the symptoms and signs until the cervix is "ripe."

The idea of individualized treatment as advocated by the essayist appeals to me. Considering the poor type of clinical material and the late stage in the disease when first seen and the large proportion of babies that survived, I would consider the results as favorable as might be expected.

DR. EMMETT D. COLVIN, Atlanta, Ga.—We encounter a large number of such patients in the obstetric clinics of Emory University, especially in those for Negro women. It is perfectly obvious that Dr. Ross' clinic must receive many of these women in a critical condition from sources outside of the University's prenatal clinic.

Several years ago in Dr. J. R. McCord's clinic, I surveyed the maternal mortalities occurring over a ten-year period. Sixty per cent of the deaths were among hypertensive women, mainly among multiparas whose pregnancy was complicated by chronic vascular disease alone or with superimposed toxemia of pregnancy. Many of the mortalities occurred among women whose histories revealed that near fatalities had occurred during previous pregnancies or labors. Some had refused surgical sterilization.

I desire to confine my remarks to a discussion of chronic vascular disease hypertension. In the management of patients with late pregnancy hypertension, we feel it important to differentiate between that of true toxemia and that of vascular disease. Especially is this important in the early stage of developing hypertension.

We have learned to attach great significance to the results obtained by study of the retinal vessels early in pregnancy, as well as late after hypertension has developed. Over 60 per cent of women with normal blood pressure readings and normal urinary findings, but showing a disturbance in the arteriovenous ratio and increased light reflex of the retinal arterioles early in pregnancy will develop hypertension four to six weeks from term. Bartholomew found this information obtained early in pregnancy, combined with blood pressure behavior, degree of albuminuria and symptoms, to be of great value in the diagnosis and management of developing hypertension late in pregnancy. The information is of special value in the final classification of the type of hypertension.

In addition, we have found that a careful study of the properly formalin-fixed placenta of a hypertensive patient offers valuable information in the final classification of the hypertensive woman. The conspicuous absence of subacute or acute infarction in the placenta of cases of chronic vascular disease and the presence of this type of infarction in those from true toxemia cases, we feel, has served well in the final classification of the type of hypertension which complicated the pregnancy.

If one reviews the charts of previous pregnancies of mortalities due to hypertensive complications, it will be found that the severity of the hypertension has increased as parity has increased and in many instances the woman was a near fatality in one or more of the previous pregnancies.

To me, the practical solution to the problem of hypertension due to vascular disease late in pregnancy lies not primarily in the manner of treatment, but in the accurate classification of the type of hypertension and prevention of future pregnancies in this group of women. So many of these women already have too many children at home.

## BLOOD PLATELET STUDIES DURING PREGNANCY AND THE PUERPERIUM\*

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A GREAT amount of work has been done on the estimation of blood platelets and the divergent findings are largely the result of differences in the methods of examination.

The blood platelet is so small, and its existence outside the body is so difficult to estimate that it is not surprising that many methods used to examine them yield many errors.

The enumeration of platelets as carried out on cutaneous blood is stated to have only a limited value, however, to discard all the evidence accumulated by employing this method would be discarding approximately three-fourths of the available knowledge on the variations in the number of platelets.

The mode of origin of the platelet from the megakaryocyte suggests that it is the product of the cell rather than a cell itself.

In the performance of their function, platelets unlike most cells are nearly always irreversibly altered or destroyed. These are essential points to keep in mind when studying the differences in platelet content between arterial, venous, and cutaneous blood.

### The Origin of Blood Platelets

The origin of blood platelets is the source of much controversy. Toeantins<sup>1</sup> outlines numerous theories as to their origin, but tends to support the work of Wright<sup>2</sup> who states "blood platelets are detached portions or fragments of the cytoplasm of the megakaryocytes which are in such relationship to the blood channels in the bone marrow that detached portions of their cytoplasm are quickly carried by the blood current into the circulation."

Platelet production may occur whenever mature megakaryocytes exist, namely bone marrow, spleen, liver, and lungs. Many authors have stated that the spleen is one of the main sources of blood platelets. Splenectomy, however, is usually accompanied by a rapid rise in the number of platelets in the circulating blood. There is usually a concurrent increase in activity in the megakaryocytes of the bone marrow following splenectomy, strongly suggesting that the bone marrow is the main source of platelets.

### Common Factors Which Influence the Number of Platelets in the Circulating Blood

*Physiological.*—There are significant differences in platelet counts carried out on arterial, venous, and cutaneous blood. In a series of forty males

\*Read, by invitation, at the Fifty-Eighth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Hot Springs, Va., Sept. 4 to 6, 1947.

examined in Philadelphia by Tocantins,<sup>3</sup> during the winter and spring, the average number of platelets found in blood taken from the arm was: arterial blood 350,000 venous blood 310,000, and cutaneous blood 250,000.

**Posture.**—Change of posture is stated to cause considerable variation in the number of platelets. Within fifteen seconds of suddenly getting up, after resting horizontally for one-half hour, the platelet count is decreased 20 per cent or more. On the other hand certain authors maintain that strenuous exercise causes a rise in the number of platelets while other authorities state that exercise or posture cause no alteration in platelet counts.

**Season.**—In man, according to Kemp,<sup>4</sup> the number of platelets decrease during the summer months, while in the winter platelet counts from arterial and venous blood show a significant increase, counts carried out on cutaneous blood show no definite differences in the two seasons.<sup>5</sup>

**Feeding.**—The effect of feeding on the number of platelets is extremely controversial; many authors state that there is no change after ingestion of food, Benhamou and Nouchy<sup>6</sup> state that an increase in the number of platelets after feeding is a constant factor in blood obtained from cutaneous puncture in man. The increase appears twenty minutes after the ingestion of food, and reaches its maximum in forty to sixty minutes with a return to normal within two hours.

**Menstruation.**—Pohle<sup>7</sup> states that the average platelet count is at its lowest level on the day of onset of menstruation, rapidly rising to a level of 275,000, remaining constant for two weeks, then there is a steady slow progressive fall during the remainder of the cycle.

**Drugs.**—Arsphenamines produce a short transitory decrease in the number of platelets (McCarthy and Wilson<sup>8</sup>).

Ephedrine subcutaneously causes an increase in the number of platelets within five minutes in normal patients or patients with a chronic thrombopenia.

Ether anesthesia does not alter the number of platelets. Small or normal doses of such drugs as heroin, morphine, demerol do not significantly alter the platelet counts.

**Pregnancy.**—There is no general agreement as to the changes in the numbers of platelets during pregnancy. Rebaudi<sup>9</sup> found a great increase in the first four months of pregnancy and also in the last month just before delivery. Benhamou and Nouchy<sup>10</sup> observed only a slight increase in the last months of pregnancy. Bland, First, and Goldstein<sup>11</sup> found no important differences between platelet counts in the pregnant and the nonpregnant woman. A definite decrease appears to be fairly constant in the first stage of labor with a return to normal level in the second stage.

One author states that in moderately toxic patients the number of platelets does not differ from that of normal pregnant patients. In severe pre-eclamptic toxemias and eclampopies a marked decrease will be observed.

**Age.**—According to Tocantins there is no significant change in platelet counts until the age of 60 years, after which age there is a definite decrease.

Numerous other factors influence platelet count levels, namely blood dyscrasias, disorders of the endocrine system, trauma, fractures, operative procedures, but need not be considered in this paper.

### Methods of Estimating Platelets

The direct method in which platelets are counted in a counting chamber is similar to that of counting red and white blood cells, the results are estimated per cubic millimeter of blood.

The indirect method is a smear method in which a blood smear is made and stained with a platelet stain, the number of platelets are calculated in relationship to the number of red blood cells.

In this series we chose the direct method, because it appeared simple and is the method employed by the department of hematology in the Montreal General Hospital. Cutaneous blood was used because the seasonal variation is not important. Free-flowing blood was obtained from the lobe of the ear by means of a stab wound obtained by a stylet puncture, which ensured free flow of blood in all cases.

The method used was as follows:

A solution made of:

Sodium citrate	2.5	Gm.
Mercury bichloride	0.005	Gm.
Brilliant cresyl blue	0.5	Gm.
Aqua dist. ad	500	e.e.

This solution was used as a stock mixture. Fresh solution is made up weekly for use in platelet counting. To 40 e.c. of the stock solution add 1 Gm. of fresh powdered urea. In order to cut down the error due to contamination, etc., daily counts were carried out on the solution itself prior to actually counting blood platelets.

Free-flowing blood was obtained by a deep stab wound in the lobe of the ear. The blood was drawn up to the 0.5 mark in a white cell pipette, and the diluting fluid was drawn up to the mark 1. The pipette was sealed with a rubber band and shaken for one minute, and allowed to stand for fifteen minutes. A drop of the solution was placed on the counting chamber and counted in a similar manner to that of counting red blood cells, that is to say five small squares were counted and the total estimated in platelets per cubic millimeter of blood.

Our platelet counts were made by one technician who was trained in the hospital laboratory for this purpose. It was felt that with use of a careful technique carried out by the same technician, the results should be reasonably accurate and consistent.

In order to establish a normal level, thirty nonpregnant women were chosen who were in the same age group as the pregnant patients to be examined. Samples of the blood for examination were obtained two weeks prior to the onset of menstruation, in order to eliminate the fall in platelet level which occurs just prior to the onset of each period. There was considerable variation, the minimum count obtained was 159,000 and the maximum count in this series was 223,000, the average for this group was 182,000.

Tocantins reviewed the work of fifteen authors who had carried out platelet counts by the direct method using cutaneous blood. He found that the minimum count was 174,000, while the maximum was 400,000. The average platelet count in this group was 187,000, which closely approximates our normal series.

In order to eliminate as many common factors as possible which influence the number of platelets, the following precautions were taken: all blood was taken at least two hours after a meal; the exercise factor was constant because

all patients walked about the same distance to the hospital from the street-car; and all patients had been sitting in the waiting room at least one-half hour prior to obtaining the blood. These counts were carried out from March until July. A check was made to determine whether there was any seasonal variation. It was found that counts done in June and July averaged 10,000 platelets lower than those in March and April, this difference does not seem significant. Drugs were not used in these prenatal patients, therefore could not cause any error.

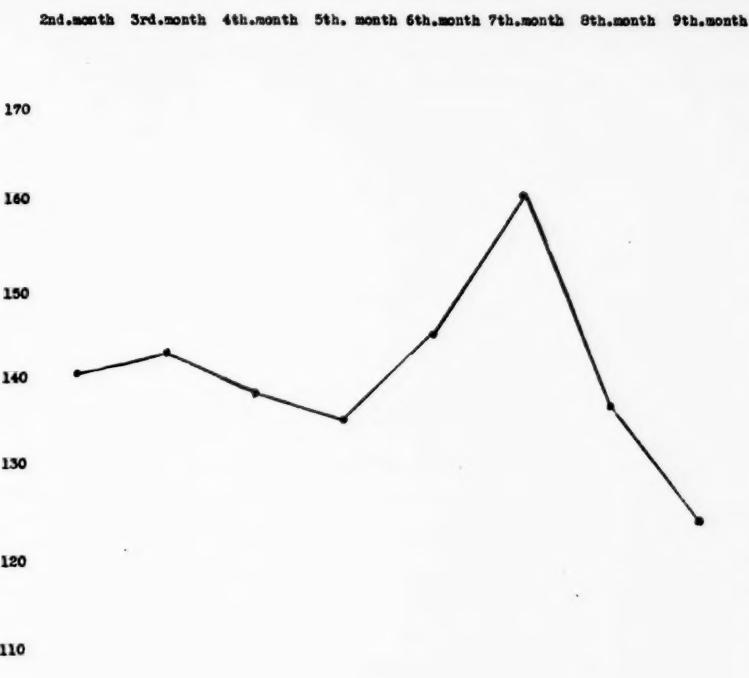


Fig. 1.

TABLE I. 200 PLATELET COUNTS BY MONTHS SHOWING VARIATION AND AVERAGES

MONTH	VARIATION		AVERAGE
	MINIMUM	MAXIMUM	
Second	61,000	235,000	141,000
Third	55,000	210,000	144,000
Fourth	63,000	207,000	139,000
Fifth	85,000	198,000	136,000
Sixth	60,000	228,000	146,000
Seventh	110,000	237,000	164,000
Eighth	54,000	226,000	138,000
Ninth	56,000	190,000	125,000

Table I and Fig. 1 show the results of 200 platelet counts by months. There is considerable variation in the counts for each period, but the average platelet count is lower than the normal level of 182,000. The curve maintains a fairly even level except for an unexplained rise at the seventh month. The average decrease below the normal level was 40,000. It is interesting to note that in recent work on plasma protein determinations in 600 cases of normal pregnancy, one of us (J. L. M.) noted that plasma proteins appeared to be below normal in this group.

The mean normal plasma protein level is 7.2 grams. In the above series the mean level of plasma proteins during the first trimester was 6.1 Gm., falling to 5.9 Gm. in the last trimester of pregnancy.

There appears to be a relationship between the platelet and plasma protein levels in these two series which may be significant.

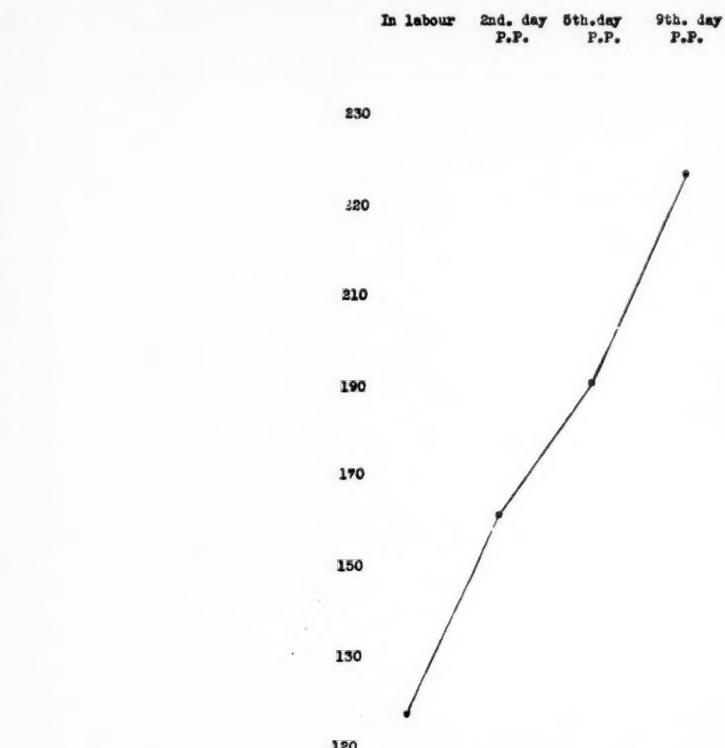


Fig. 2.

TABLE II. PLATELET COUNTS IN LABOR AND SECOND, FIFTH, NINTH DAY POST PARTUM; SHOWING VARIATION AND AVERAGE COUNTS

TIME	VARIATIONS	AVERAGE
In labor	66,000—201,000	124,000
Second day post partum	108,000—223,000	161,000
Fifth day post partum	122,000—277,000	191,000
Ninth day post partum	130,000—301,000	224,000

Table II and Fig. 2 show that blood platelets are very definitely low in early labor, averaging 124,000, rising rapidly to a level of 224,000 by the ninth day post partum. MacArthur again points out that in his series the plasma proteins rose rapidly in the puerperium to a level of 6.95 Gm., again pointing to a relationship between these two factors in pregnancy and the puerperium.

Some authors have stated that a rapid rise in the number of blood platelets predisposes to phlebothrombosis and possibly thrombophlebitis. If this is true the rapid rise, during puerperium of blood platelets would suggest the necessity of early movement and early exercise in the postpartum patient to avoid the above-mentioned complications.

During the period of our investigation, seventeen patients were admitted to the hospital for the treatment of toxemia of pregnancy. They fell into two

groups, the first a group of ten patients with moderate hypertension, albuminuria, and varying degrees of edema. The second group consisted of six cases of severe pre-eclamptic toxemia and one case of eclampsia. This group showed a higher elevation of blood pressure, an increase in the amount of albumin, and a marked degree of edema.

TABLE III. MILD TOXEMIAS

CASE	BLOOD PRESSURE	ALBUMIN	EDEMA	PLATELETS
1	140/110	+	slight	148,000
2	150/100	+	slight	155,000
3	140/ 90	FT	moderate	134,000
4	160/ 90	FT	slight	223,000
5	140/ 90	FT	slight	143,000
6	150/ 90	+	moderate	152,000
7	148/ 90	+	moderate	145,000
8	140/100	+	moderate	154,000
9	140/100	+	slight	153,000
10	138/ 86	+	moderate	145,000

Ten cases of moderate toxemia were studied, and the platelets varied from 134,000 to 223,000, averaging 155,000, which is approximately the same as platelets in the nontoxic group. Unfortunately, plasma protein determinations were not carried out on this group, due to lack of staff, therefore the relationship between the two factors cannot be ascertained.

TABLE IV. SEVERE TOXEMIAS

CASE	BLOOD PRESSURE	ALBUMIN	EDEMA	PLATELETS	PLASMA PROTEINS
1	180/100	+	+	76,000	4.0 Gm.
2	180/106	+++	+++	98,000	4.2 Gm.
3	158/100	++++	+++	72,000	5.7 Gm.
4	190/130	++++	+++	117,000	3.8 Gm.
5	200/140	++++	++	117,000	4.1 Gm.
6	160/100	++++	++	88,000	3.9 Gm.
7	150/100	+	++	120,000	5.5 Gm.

Six severe pre-eclamptic and one eclamptic patient were examined. The platelet counts were significantly lower than in normal or mildly toxic patients. The platelet counts ranged from 72,000 to 120,000 in the seven patients, the average platelet count being 97,000. Plasma protein levels were definitely low, ranging from 3.9 to 5.5 grams.

It was interesting to note that when the plasma protein levels rose or returned to normal, in all cases there was a parallel rise in the number of blood platelets.

In a small series of anemias associated with pregnancy described by Osler, there appeared to be a striking relationship between blood platelet counts and plasma proteins.

On admission, platelet counts in three cases were 48,000, 77,000 and 97,000, respectively, with plasma protein at 3.4 Gm., 3.6 Gm., and 5.2 Gm. The case of Lederer's anemia, on the other hand, showed a platelet count of 300,000, and plasma proteins of 7.2 grams.

It is acknowledged that this group is small, but the observations may be significant and may provide an added diagnostic point in distinguishing between Lederer's and Osler's anemia pregnancy.

A series of forty-five normal pregnant patients was studied to ascertain the relationship between platelet counts and blood loss at delivery. These patients were a group of private patients admitted in early labor.

Sedatives employed were heroin 0.005 milligram, Demerol 100 milligrams, and occasionally, morphine 0.015 milligram. Gas oxygen anesthesia was used at the time of delivery. Pituitrin, 0.5 e.c., was administered intramuscularly following the delivery of the baby, and ergometrin, 0.125 milligram, intravenously, after the expression of the placenta.

The lowest platelet count was 84,000, and the blood loss was 300 cubic centimeters. The highest platelet count was 225,000, with a blood loss of 300 cubic centimeters. The greatest blood loss, namely 700 e.c., occurred in a patient whose platelet count was 203,000.

It is recognized that there are many other factors which play a part in postpartum bleeding, but in this series no relationship between platelet counts and postpartum bleeding could be established.

#### Comment

There is a great deal of controversy as to the value of blood platelet determinations. There are numerous techniques outlined in the literature and great variations are reported by different authors. However, as Aggeler, Howard, and Lucia point out, if a given method is chosen, all steps carried out carefully, and one trained technician made all the counts, the results obtained should be of value.

Two hundred platelet determinations were carried out on normal prenatal patients.

Two hundred eleven counts were done on patients in labor and during nine days of the puerperium.

Platelet counts were carried out on seventeen toxic patients and four cases of severe anemia of pregnancy.

#### Conclusions

1. The average platelet count in nonpregnant patients in our series was 182,000.
2. Platelet counts during pregnancy were definitely below the normal level, averaging 141,000.
3. Plasma protein determinations in normal pregnant patients was also found to be below normal, falling from 6.1 Gm. in the first trimester to 5.9 Gm. in the third trimester.
4. Platelet counts in patients in early labor were definitely low, averaging 124,000, followed by a rapid rise in the puerperium, 161,000 on the second day post partum, to 224,000 on the ninth day.
5. There is a parallel rise in plasma proteins during the puerperium to a level of 6.9 grams.
6. In moderately toxic patients there is no significant change in blood platelet counts.
7. In severe pre-eclamptic and eclamptic patients blood platelets are definitely lower than normal, averaging 97,000.
8. Plasma protein levels are also low in this group, ranging from 3.9 to 5.5 grams.

9. In the pernicious anemias of pregnancy platelets and plasma proteins are markedly below the normal levels.

10. No relationship has been established between platelet levels in the circulating blood and the amount of blood loss occurring at the time of delivery.

11. The apparent relationship between plasma proteins and platelets may be significant and further work will be done to include bone marrow punctures to ascertain the value of the above impressions.

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### Discussion

DR. PAUL TITUS, Pittsburgh, Pa.—The fact that such a simple thing as change of posture, to the extent of a 20 per cent decrease, is brought about merely by sitting erect from a horizontal position, suggests that fluctuations or deviations from normal cannot be characteristic of disease conditions. Such simple things as seasonal weather changes, eating food, and ingestion of certain drugs are able to cause changes in the blood platelet count. There is widespread difference of opinion about the effect of pregnancy, if any, on the blood platelet count.

The authors have carried out a comprehensive and painstaking study with a considerable series of cases. Despite this, however, they appear to have formed no definite conclusions regarding any clinical significance of variations in blood platelet counts during pregnancy, except that in severe toxemia and in pernicious anemia of pregnancy platelet counts are below normal.

With the uncertainty of what constitutes a normal platelet count, and the information from the authors that such trifling events may cause wide variations from normal, this study seems to demonstrate that blood platelet counts during pregnancy have no clinical application and are of no more than academic interest.

DR. HERMAN B. VAN WYCK, Toronto, Canada.—This is another approach to one of the most important problems the obstetricians face, the problem of the production of the toxemias, and, I believe, in view of the fact that our knowledge of platelets is so uncertain, as well as their origin and function, that we should not be too ready to agree with Dr. Titus that this matter has only academic interest. They may come from the megakaryocytes of the bone marrow or elsewhere. The variation in the toxemias may be evidence of a protective mechanism which in the severest forms of toxemia is failing.

Many of the changes in pregnancy are protective mechanisms. It appears possible that the other explanation of the origin of platelets—the disintegration of the erythrocytes—may explain that we are dealing with a protective mechanism of some sort, and that in the capillary hemorrhage of the severest toxemias mechanism has broken down.

We have recently begun in Toronto to find out what counts we get and we use the direct method. Our findings in normal and mild toxemia pregnancies are substantially the same as Dr. Ward has reported.

It would be interesting to follow the globulin in these platelet variations in the toxemias because we know that globulin increases during the process of immunization, and perhaps the fall in platelet count is related to toxemic conditions in which immunization has failed entirely.

DR. JAMES R. BLOSS, Huntington, W. Va.—Dr. Ward's paper calls our attention to some very significant things. It is true that we do not know much about blood platelets, but one comment that he made regarding the diminution in the number of platelets, the lowering of plasma, and the development of thrombophlebitis seems to me to have something very significant for us.

I had been brought up, as many of you were, upon the importance of rest after delivery. When my associate came back from the Navy he began getting his patients up very early. It seemed to me that if what I had been taught to do, and what I had taught him in the fifteen years before he entered the Navy, were true, we were in for a bad time and would run into many difficulties. He is getting the patients out of bed within eighteen to twenty-four hours. He has not had any cases of thrombophlebitis. The patients delivered by abdominal section are also encouraged to sit up in twenty-four hours. There may be something in this matter of the platelet count being a great help to us in prognosis and care, and since it goes up on the ninth day so markedly, and even such change of posture as getting the patient up, which Dr. Titus calls attention to, may make a change in the blood count. I am wondering about the significance of the platelet count. In the course of time we may be able to make a number of deductions and learn a great deal about the value of this procedure.

DR. WARD (Closing).—I am in hearty agreement with Dr. Titus that the figures outlined in this paper do not prove anything. We were interested in finding out what changes occurred in platelet counts during pregnancy and the puerperium and have presented the results as we found them.

I am glad to know that our findings correspond with the work done by the Toronto group. We propose to continue this work and investigate the relationship between platelet levels, plasma proteins, and protein metabolism during pregnancy.

## HYPERTHYROIDISM AND PREGNANCY\*

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**H**YPERTHYROIDISM is an uncommon complication of pregnancy. Its reported incidence ranges from 0.03 to 3.7 per cent of all pregnancies, with an average of about 0.2 per cent.<sup>1-3</sup> Nevertheless, dangers to the mother and fetus make it important that proper treatment be instituted promptly. Uncontrolled hyperthyroidism not only leads to a high incidence of abortions, but also subjects the mother to all the hazards inherent in thyrotoxicosis. On the other hand, suitable management of hyperthyroidism in pregnancy results in a fetal mortality rate not greatly higher than that of otherwise uncomplicated pregnancy, and also affords control of maternal thyrotoxicosis comparable to that in nonpregnant women. Pregnancy does not seem to alter the course of hyperthyroidism in most cases.

Although some earlier writers have advocated therapeutic abortion in hyperthyroidism, most recent authors are agreed that such a procedure is rarely justified and, in fact, is actually dangerous in that a thyroid crisis may be precipitated. Means<sup>4</sup> succinctly stated: "It is the thyrotoxicosis, not the pregnancy, which should be interrupted."

In this paper we propose to discuss the management of hyperthyroidism coincident with pregnancy and the results of such management. A brief résumé of the literature of this subject will be presented. Hypotheses of the etiology of goiter and of hyperthyroidism and the interrelationship of hormones concerned in the activity of the thyroid gland do not come within the scope of this communication.

In previous papers<sup>5-9</sup> one of us (R. D. M.) has stated that, with rare exceptions, the treatment of hyperthyroidism in pregnant women does not differ from that in nonpregnant women. For exophthalmic goiter, a trial of iodine is indicated; if this fails to control the disease, subtotal thyroidectomy should be performed. In cases of adenomatous goiters with hyperthyroidism, thyroidectomy should be performed after preparation with iodine unless the pregnancy has progressed to the last six weeks, and even then it is indicated if the basal metabolic rate has been more than +50 per cent for a considerable length of time, if there is evidence of myocardial insufficiency, or if the goiter is producing important mechanical symptoms, such as dyspnea due to pressure on the trachea.

Other authors have been in substantial agreement with these conclusions. Yoakam<sup>2</sup> studied thirty-five patients with hyperthyroidism in pregnancy and decided that conservative treatment, employing iodine, should be tried; then

\*Read at the Fifty-Eighth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Hot Springs, Va., Sept. 4 to 6, 1947.

thyroidectomy should be performed if necessary. He cited a case in which thyroid crisis was precipitated by therapeutic abortion. With minor differences in management Clute and Daniels,<sup>10</sup> Frazier and Ulrich,<sup>11</sup> Bothe,<sup>12</sup> Norrman,<sup>13</sup> Javert,<sup>14</sup> and Davis<sup>15</sup> followed a similar regimen.

Davis<sup>15</sup> stated that during the first half of pregnancy thyroidectomy entails little risk to mother or fetus, but late in pregnancy he advised postponement of thyroidectomy until the puerperium.

Baumgartner<sup>16</sup> followed a similar plan of treatment, and suggested that near term the use of iodine and cesarean section might be considered; in two cases of recurrent exophthalmic goiter he employed roentgen therapy. McLaughlin and McGoogan,<sup>3</sup> Javert,<sup>14</sup> and Kibel<sup>17</sup> observed a high incidence of toxemia of pregnancy in their cases in which hyperthyroidism was associated.

Portis and Roth<sup>18</sup> recommended rest, sedation, and good hygiene without administration of iodine, and reserved thyroidectomy for a small group of cases in which the severity of the hyperthyroidism increased and visceral damage occurred. They stated that the use of iodine might obscure the course of the disease and also might produce iodine fastness, if surgical intervention were decided on later. Interruption of pregnancy was considered to be contraindicated except in unusual circumstances.

### Newer Agents Used in Treatment of Hyperthyroidism

Recently two therapeutic agents, thiourea with related goitrogenic drugs, and radioactive iodine, have been introduced for the treatment of hyperthyroidism. Investigation of the goitrogens was begun in 1928 when Chesney, Clawson, and Webster<sup>19</sup> produced hyperplastic goiter and lowered metabolism by feeding a cabbage diet to a colony of rats used for the study of syphilis. Subsequently, four different groups of goitrogens have been identified: cyanides,<sup>20</sup> thiocyanates,<sup>21</sup> certain aniline derivatives related to the sulfonamides,<sup>22</sup> and thiourea and its derivatives.<sup>23, 24</sup>

Of these four, only the last have been applied to the treatment of hyperthyroidism. Astwood,<sup>25</sup> in 1943, first reported the clinical use of thiourea and thiouracil. Various workers since then have studied and reported large numbers of cases. Results indicate that in the majority of cases hyperthyroidism can be controlled by thiourea or its derivatives, but there is a high incidence of recurrence of symptoms after administration of the drug is stopped. Thus far, one of the major factors limiting the use of these compounds has been the toxic reactions associated with their administration; the most serious reaction, agranulocytosis, had produced twenty-one known deaths by February, 1946.<sup>26</sup> According to Astwood and VanderLaan,<sup>27</sup> propylthiouracil has less propensity to produce toxic reactions and the experiences of others tend to confirm this statement.

The production of benign and malignant thyroid tumors in rats by the concomitant administration of thiouracil and 2 aceto-amino-fluorene was reported by Bielschowsky.<sup>28</sup> The effect of chronic treatment of adult rats with 0.1 per cent solution of thiouracil for three to four months was said by Money<sup>29</sup> to have been followed by the development of thyroid adenomas in 100 per cent of animals, and Purves and Griesback<sup>30</sup> reported that the long-continued use of thiourea in rats produced thyroid tumors in most of the rats. In two of

thirty rats metastatic lesions of thyroid origin were found in the lungs. Broders and Parkhill<sup>31</sup> have commented on the similarity between carcinoma of the thyroid and the picture of cellular hyperplasia with numerous mitotic figures in a thiouracil goiter. Hinton and Lord<sup>32</sup> have suggested that thiouracil might prove capable of increasing the incidence of malignant lesions in the thyroid. However, in no instance has any accepted evidence been presented that thyroid tumors have been produced in man by thiourea or its derivatives.

The exact place of thiourea and its derivatives in the treatment of hyperthyroidism has yet to be determined. While some clinicians have concluded that these drugs can replace thyroideectomy in many cases of hyperthyroidism, others are of the opinion that their use should be limited to selected patients, who are unfit for thyroideectomy, and to the preparation of patients with hyperthyroidism for operation.

The current clinical usage of these agents at the Mayo Clinic, as stated by Haines and Keating<sup>33</sup> is: "(1) as a total treatment for hyperthyroidism in those cases in which complications prohibit surgical treatment of the disease, (2) as a preoperative treatment in those cases in which the severity of the hyperthyroidism is responsible for an anticipated high surgical risk, or (3) as a pre-operative treatment in those cases in which complications increase the surgical risk, especially if temporary relief of hyperthyroidism will bring about some amelioration of the complicating condition."

The mode of action of thiourea and its derivatives is not completely understood. It has been demonstrated that uptake of iodine and production of thyroid hormone by the thyroid are inhibited.<sup>34-37</sup> Present evidence seems to favor the theory that these compounds interfere with some oxidative enzyme concerned with the synthesis of the hormone.<sup>38, 39</sup>

Concerning the effect of use of thiouracil and related compounds in the course of pregnancy, a number of experiments with animals gave warning that danger might be encountered. The young of rats fed thiouracil during pregnancy were found to have enlarged thyroid glands; however, subsequent growth and development were normal if no thiouracil was administered after birth.<sup>40</sup> Administration of thiouracil to young rats caused retardation of growth and other cretinous changes, as well as hyperplastic goiters.<sup>41</sup> It has been shown that administration of thiouracil to lactating women results in a relatively high concentration in the milk.<sup>42</sup> Its administration to lactating rats caused retardation of growth in the suckling young.<sup>43</sup> Hatching of chick embryos was delayed as much as ten days by injection of thiourea into the yolk sac.<sup>44</sup> Feeding thiouracil to hens caused enlarged thyroids in their chicks.<sup>45</sup>

Several reports of the administration of thiouracil to pregnant women have been published. McGavaack, Gerl, Vogel, and Schwimmer<sup>46</sup> employed thiouracil in a case of pregnancy and adenomatous goiter with hyperthyroidism. Treatment was initiated during the fifth month of pregnancy and continued for five and one-half months. Control of the hyperthyroidism and a normal delivery resulted.

Rose and McConnell<sup>47</sup> gave thiouracil to a patient with hyperthyroidism; treatment was started when the patient had been pregnant for four months; it was continued for fifteen days and then discontinued for one month, after which time it was given until one week before delivery. The patient was delivered at term of a healthy male infant who gave no evidence of enlargement or dysfunction of the thyroid gland.

Palmer<sup>48</sup> reported three cases in which thiouracil was administered during pregnancy. In one case administration of thiouracil was started in the fourth month of pregnancy and continued until the ninth month, when it was stopped because the basal metabolic rate was less than +10 per cent. The delivery was uncomplicated and the infant was normal. In another case, the results were inconclusive, and in a third the outcome was not stated.

Eaton<sup>49</sup> treated thyrotoxicosis in pregnancy with thiourea and thiouracil in two cases. The first patient received the drugs from the third to the eighth month of pregnancy; a healthy child was born without incident. The second patient received thiouracil prior to and during the first month and then during the last seven months of pregnancy. Delivery was by cesarean section because of placenta previa. The female infant had an enlarged soft thyroid, the entire outline of which was readily visible in the neck; the infant was normal otherwise. At the age of three months the infant's growth had been normal and the thyroid was no longer apparent. Eaton suggested that administration of thiouracil be replaced by iodine some weeks before delivery.

Davis and Forbes<sup>50</sup> reported a case in which a woman 21 years old who was taking 0.2 Gm. of thiouracil daily became pregnant. She continued to take this dose until her sudden and unexplained death in the sixth month of pregnancy. Examination revealed in the mother a hyperplastic thyroid and a soft dilated heart. Examination of the fetus showed an enlarged thyroid. The gland contained no colloid; the acini were enlarged and composed of fairly tall columnar cells, and the small vessels were congested. The authors stated that the fetal thyroid had the general appearance approximating that found in adults with thyrotoxicosis. They suggested that the effect was due to the direct action of thiouracil on the fetal thyroid rather than to the effect of maternal thyrotropic hormone or to an effect of lack of thyroxin from the mother, who was not myxedematous.

Williams<sup>51</sup> gave thiouracil to five pregnant women. Three received thiouracil before and during the entire course of pregnancy, one received it during the last six weeks, and the fifth, during the last month of pregnancy. All six infants, including one set of twins, were in excellent condition at birth, and none had a goiter.

Sexton<sup>52</sup> reported the cases of two women who were carried through pregnancy by means of thiouracil without untoward effect on the course of pregnancy or on the fetus.

Carns and Poser<sup>53</sup> reported a case in which thiouracil was administered from the second to the sixth month of pregnancy, except for one month during which treatment was not followed, although it was advised. It then was given again during the last month of pregnancy. A healthy child was born.

Astwood and VanderLaan<sup>27</sup> found that, in a series of 100 patients who were treated with propylthiouracil for hyperthyroidism, three became pregnant and were delivered of normal children during the course of therapy.

Vogt<sup>54</sup> reported a case in which methylthiouracil was given daily until the time of parturition. Although the patient's thyroid enlarged during the treatment, the child's thyroid was normal.

Freiesleben and Kjerulf-Jensen<sup>55</sup> used methylthiouracil to control successfully the hyperthyroidism of a pregnant patient. Because of complicating heart failure the fetus was removed in the fifth month of pregnancy. The fetal thyroid was hyperplastic.

Experience at the Clinic with thiouracil in pregnancy has been limited to one case.

**CASE 1.**—This patient, a white woman (gravida ii, para i), 23 years old, was registered in March, 1944, at which time a diagnosis of exophthalmic goiter

was made. The basal metabolic rate on March 23, 1944, was +91 per cent. The patient had been taking Lugol's solution daily for nine months prior to admission, and continued to take it until April 29, 1944. Because of the inadequate response to Lugol's solution, administration of 0.2 Gm. of thiouracil every eight hours was started April 29; on September 13 the dose was reduced to 0.4 Gm. daily, and was omitted November 6, when it was found that the patient was approximately two months pregnant. Administration of Lugol's solution was begun again, and thyroidectomy was performed on Nov. 24, 1944. During treatment with thiouracil the basal metabolic rate had declined from +75 on April 26, 1944, to +24 per cent on Nov. 6, 1944, and parallel improvement in the patient had occurred. When seen in March, 1945, the patient was clinically euthyroid, and had a basal metabolic rate of +12 per cent. She reported later that on June 28, 1945, she gave birth to a normal infant weighing 8 pounds (3.6 kg.), and that both mother and baby had been well.

On the basis of the experiences mentioned in the literature, it would appear that the advisability of using thiouracil during pregnancy is not clearly established. However, children of mothers treated with thiouracil during pregnancy should be observed for a longer time before opinions on this point are formed. To our knowledge, no human infant has been allowed to nurse if the mother is taking thiouracil. On the basis of animal experimentation, one may conclude that such a procedure might result in unfavorable effects on the growth and development of the child.

From such a small series of cases as those reported in the literature, it is difficult to evaluate the results of treatment in regard to the effectiveness of the thiourea and its derivatives in controlling hyperthyroidism during pregnancy. In general, the control in those cases described in the literature was neither remarkably better nor worse than that in a comparable group of non-pregnant women, and there is no reason to assume any unusual difficulty in controlling hyperthyroidism with thiouracil or propylthiouracil in such cases.

Radio-iodine was first made by Fermi<sup>56</sup> in 1934, shortly after Joliot and Curie<sup>57</sup> had discovered artificially produced radioactivity. In 1938 Hertz, Roberts, and Evans<sup>58</sup> employed radio-iodine to determine the concentration of iodine in the thyroid; subsequently wide use has been made of this substance as a tracer in the study of thyroid physiology. In 1942 Hertz and Roberts<sup>59</sup> and Hamilton and Lawrence<sup>60</sup> reported that radio-iodine had been used successfully in the treatment of cases of hyperthyroidism. Hertz and Roberts<sup>61</sup> in 1946 published the results of three to five years of study of twenty-nine cases in which hyperthyroidism was treated with radio-iodine. In the same year, Chapman and Evans<sup>62</sup> reported another similar series of twenty-two cases. The results of treatment in these instances have been encouraging, but it is still too early to predict the future of radio-iodine as a therapeutic agent. Its place in research is well assured. So far no instance in which radio-iodine has been employed in the treatment of hyperthyroidism in pregnancy has come to our attention. One patient whose case was reported by Hertz and Roberts became pregnant subsequent to such treatment. We would be hesitant to use radio-iodine in the treatment of hyperthyroidism in pregnancy until more is known of the extrathyroidal and delayed effects of radio-iodine.

### Data on Thirty Instances of Hyperthyroidism and Pregnancy

Mussey, in 1939, reported the results of treatment in thirty-six cases of pregnancy with hyperthyroidism observed at the Clinic from 1923 to 1937, inclusive. In this paper we wish to present data on a similar group of cases from the same clinic from 1938 to 1946, inclusive, a nine-year period in which thirty pregnancies of twenty-nine patients were complicated by hyperthyroidism, for one patient had a recurrent exophthalmic goiter during a second pregnancy. In general, treatment followed the plan outlined by one of us (R. D. M.) which we mentioned in a previous paragraph. An attempt was made to control mild exophthalmic goiter by oral administration of iodine in the form of Lugol's solution; if necessary, thyroidectomy was performed, after preoperative preparation with iodine. Adenomatous goiter with hyperthyroidism was treated by thyroidectomy in all cases.

Of the twenty-nine patients, nine had adenomatous goiter with hyperthyroidism; eight of these nine patients underwent thyroidectomy during pregnancy, and one after a spontaneous abortion (Table I). Twenty of the twenty-nine patients had exophthalmic goiter during one pregnancy, and one of these had a recurrence of the exophthalmic goiter with a subsequent pregnancy. In seventeen of the twenty-one instances of exophthalmic goiter thyroidectomy was performed during pregnancy. In sixteen it followed treatment with iodine and in one (Case 1) thiouracil and later iodine were used. In three of the twenty-one instances the thyrotoxicosis was controlled adequately with iodine during pregnancy, and in one thyroidectomy was performed after spontaneous abortion which began before definite treatment of the thyrotoxicosis had been started. In five instances the exophthalmic goiter was recurrent; treatment in four of these consisted of thyroidectomy during pregnancy, and the symptoms in the fifth were controlled by iodine. There were no maternal deaths. In all instances the hyperthyroidism was well controlled when the patient left the clinic.

TABLE I. TREATMENT USED TO CONTROL HYPERTHYROIDISM DURING PREGNANCY\*

TREATMENT	EXOPHTHALMIC GOITER	ADENOMATOUS GOITER
Iodine	3	0
Iodine and thyroidectomy during pregnancy	16	8
Iodine, thiouracil and thyroidectomy during pregnancy	1	0
Spontaneous abortion before treatment	1	1
Total pregnancies	21	9
Patients	20	9

\*Hyperthyroidism was controlled in all cases when patients were dismissed from clinic.

In ten instances the condition of the mother and fetus at termination of pregnancy is not known (Table II). The results of the pregnancy are known in twenty instances. Sixteen normal infants were born. In two instances, one of exophthalmic goiter and one of adenomatous goiter with hyperthyroidism, spontaneous abortions occurred or started before treatment of the thyrotoxicosis was initiated. In one instance of exophthalmic goiter an abortion occurred eight days after thyroidectomy. In another instance a premature infant born during the eighth month of pregnancy died a few hours after birth; this infant's mother had had a hyperfunctioning adenomatous goiter removed during the third month of pregnancy, and had remained in very satisfactory condition during the rest of her pregnancy. None of the nine infants delivered at the clinic had any thyroid abnormality. The hyperthyroidism of the mothers was known to be controlled at time of delivery in the sixteen instances of full-term pregnancies, one instance of premature delivery, and in one instance of the women who had abortions.

TABLE II. OUTCOME OF PREGNANCY: 29 PATIENTS (30 PREGNANCIES)\*

RESULT	EXOPHTHALMIC GOITER	ADENOMATOUS GOITER WITH HYPERTHYROIDISM	TOTAL
Unknown	8	2	10
Spontaneous abortion before treatment	1	1	2
Spontaneous abortion during treatment	1	0	1
Therapeutic abortion	0	0	0
Child born alive and lived	11	5	16
Child born alive and died	0	1	1
Stillbirths	0	0	0
Neonatal thyroid abnormality	0	0	0
Total pregnancies	21	9	30

\*No maternal deaths.

In twenty-one instances the onset of hyperthyroidism antedated the onset of pregnancy; in five the onset of pregnancy preceded the hyperthyroidism, and in four the onset of hyperthyroidism was too insidious to be certain of its relation to pregnancy.

In those twenty-one instances in which the onset of hyperthyroidism preceded pregnancy, the course of the hyperthyroidism apparently was not affected appreciably by the pregnancy in nineteen, whereas in two cases the symptoms of hyperthyroidism were slightly increased during pregnancy. In none was there significant diminution of symptoms during pregnancy, nor any change in the course of hyperthyroidism that could be attributed to the pregnancy.

Ill-effects possibly attributable to thyroidectomy during pregnancy were seen in only two instances. In one case abortion in the third month of pregnancy occurred eight days after thyroidectomy for exophthalmic goiter. In a second case a planned subtotal thyroidectomy was interrupted after removal of only one lobe and the isthmus because of the onset of uterine contractions during the operation; later in the pregnancy the other lobe was resected without incident. The patient went to term and gave birth to a normal infant.

Three representative cases follow:

CASE 2.—A white woman, 44 years old (gravida v, para iii), was seen at the clinic on Jan. 14, 1943; she complained of nervousness and pain at the left costal margin. Three years previously she had noted gradual onset of tiredness, loss of weight, and dyspnea on exertion; these symptoms had persisted without change to the time of examination.

Physical examination revealed a blood pressure of 116/64, a pulse rate of 76 beats per minute, temperature of 98.6° F., weight of 105 pounds (47.6 kg.). The normal weight was 130 pounds (59.0 kg.). The thyroid was slightly enlarged and nodular, skin was warm and moist, and a systolic murmur was heard best over the apex. Weakness, grade 1 (on a grading basis of 1 to 4), was noted. The uterus was the size and consistency expected in pregnancy of three and one-half months' duration. The basal metabolic rates on two occasions were +33 and +26 per cent. Urinalysis, blood counts, serologic tests, and roentgenograms of the chest all gave negative or normal results. A diagnosis of adenomatous goiter with hyperthyroidism and intrauterine pregnancy was made. The patient was given Lugol's solution, and subtotal thyroidectomy was done on Jan. 25, 1943. The pathologist reported that the removed thyroid tissue consisted of multiple hyaline granular degenerating colloid and fetal adenomas in a colloid thyroid. The patient was dismissed, at which time no medication was prescribed. On July 3, 1943, the patient was spontaneously

delivered of a normal female infant weighing 2,520 Gm. Subsequent examinations of the patient at the clinic in November, 1944, and March, 1947, revealed no evidence of thyroid dysfunction.

CASE 3.—A white woman, 29 years old (gravida iv, para iii), was seen at the clinic on Sept. 8, 1942. She complained of heart consciousness, loss of 20 pounds (9.1 kg.), polyphagia, intolerance to heat, weakness of legs, and enlargement of the neck of one year's duration. Her last menstrual period had begun June 11, 1942. Examination revealed blood pressure of 162/70, a pulse rate of 120 beats per minute, and temperature of 99.8° F. Generalized vitiligo was noted; the skin was warm and moist, the thyroid enlarged, and a bruit was audible over it. Weakness, grade 1, of the skeletal muscles was present. Pigmentation of the breasts was increased, and the size and consistency of the uterus were as expected at three months of gestation. The basal metabolic rate was +53 per cent. Blood counts, serologic tests, urinalysis, and roentgenograms of the chest revealed normal conditions. A diagnosis of exophthalmic goiter and intrauterine pregnancy was made. Before any treatment was started the patient began to bleed from the vagina and, on Sept. 10, 1942, she was admitted to the hospital where she passed decidua tissue. Administration of Lugol's solution was started at this time, and on Sept. 23, 1942, subtotal thyroidectomy was performed. The pathologist reported parenchymatous hypertrophy with thyroiditis, grade 2. The patient was advised to continue to take Lugol's solution indefinitely, and was advised against pregnancy for one to two years. On dismissal Oct. 5, 1942, her general condition was good.

CASE 4.—A woman, 30 years old (gravida i), was seen at the clinic on Aug. 12, 1942, with a chief complaint of nervousness and fluttering of the heart. Thyroidectomy had been done for thyrotoxicosis four years previously. The last menstrual period had occurred in March, 1942; some vaginal bleeding had appeared five days before she came to the clinic. Examination revealed an apprehensive and nervous patient with slight exophthalmos, a diffusely enlarged thyroid, enlarged heart, a pulse rate of 110, blood pressure of 132/88, and temperature of 98° F. The size of the uterus was that expected at four months of gestation. The basal metabolic rate was +53 per cent; the concentration of cholesterol was 277 mg. per 100 c.c. of plasma; the value for hemoglobin was 10.75 Gm. per 100 c.c. of blood. There were 4,130,000 erythrocytes and 7,400 leukocytes per cubic millimeter of blood, and the serologic test and urinalysis revealed normal conditions. Slight prominence of the conus was noted in the roentgenogram of the chest. A diagnosis of recurrent exophthalmic goiter and intrauterine pregnancy was made. The patient was given Lugol's solution. The basal metabolic rate fell to +26 per cent by Aug. 22, 1942. Subtotal thyroidectomy was performed Aug. 24, 1942. The pathologist reported parenchymatous hypertrophy with thyroiditis, grade 2. On Jan. 13, 1943, spontaneous delivery of a normal male infant weighing 3,210 Gm. occurred. In May, 1943, the patient was found to have developed myxedema; treatment with desiccated thyroid restored her to normal health.

#### Summary and Comment

The recent literature concerning hyperthyroidism in pregnancy was reviewed. Thiouracil and related drugs have been used to control hyperthyroidism in pregnant women in a small number of cases reported in the literature. The occurrence of hyperplastic thyroids in a few of the fetuses would call for caution in the use of these drugs in pregnancy, although in several instances they have been successfully used without demonstrable harmful effects. Of the

goitrogenic drugs so far employed in treatment of hyperthyroidism in pregnancy, reports seem to indicate that propylthiouracil can be used with greatest safety to the mother.

In thirty instances in which the patients received treatment at the Mayo Clinic hyperthyroidism complicated pregnancy. Recommended treatment of the hyperthyroidism included oral administration of Lugol's solution and thyroidectomy for hyperfunctioning adenomatous goiters, and Lugol's solution plus thyroidectomy, if needed, for exophthalmic goiter. Pregnancy did not seem to influence the course of hyperthyroidism in most cases. Likewise, proper treatment of the hyperthyroidism allowed the pregnancy to proceed normally.

It is our opinion that the standard treatment of hyperthyroidism by iodine and thyroidectomy can be carried out safely in the great majority of cases of hyperthyroidism complicating pregnancy. Subsequent experience will afford more information about the relative advantages or disadvantages of treatment with antithyroid drugs in these cases. We have not had experience with the use of radio-iodine in pregnant women. At the moment it would seem desirable to learn more of the possible effects of radio-iodine before using it for treatment of hyperthyroidism in pregnant women.

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### Discussion

DR. FREDERICK H. FALLS, Chicago, Ill.—Dr. Mussey has presented a group of patients handled by medical management for a short period of time followed by a rather high incidence of surgical intervention. The results that have been obtained at the Mayo Clinic speak for themselves, and they are good. The only question in my mind is whether equally good results might be obtained by a complete medical management. In our clinic we have favored the avoidance of surgical intervention except in those cases where manifestly the patient is going downhill rapidly in spite of what we can do medically. We have not had much experience with the newer drugs mentioned by Dr. Mussey. We have used thiouracil in a few cases with good results. We caution against accepting the results obtained in experiments on rabbits and transferring them to the solution of human problems because usually the dosage used in the rabbits are very much higher than would be used therapeutically in the human being.

In both of the cases where we used thiouracil the mother went along perfectly well, the hyperthyroidism decreased and the fetus showed no damage; so it would seem that, so far at least, not a great deal of damage is to be expected from these drugs, in spite of the fact that they should be carefully watched while being administered.

In the consideration of hyperthyroidism complicating pregnancy we should take into account the differences in thyroid activity in different parts of the country. The thyroid behaves differently in the Great Lakes district than it does on the seacoast and things that apply in one part of the country for the therapeutic use of drugs do not necessarily apply in other parts of the country.

There is no question but that the thyroid is stimulated to increased activity in all cases of pregnancy, or at least physiologically it should be so. It is part of the physiological-clinical dystrophy which is really what pregnancy is, a change in the activity of the glands of internal secretion, and the important thing is to realize that this physiological change is reversible at the end of pregnancy, and in most patients returns to normal. There may be also an expression of dysfunction of the thyroid gland which is due to a dysfunction of some other gland, either the ovary or the hypophysis. That should not be overlooked.

It is also important to realize that with either hypo- or hyperthyroidism there is a tendency to abortion. It is very difficult for a surgeon to estimate how much of the gland to remove in order to get just the right balance. In the nonpregnant woman that does not make so much difference, but in the pregnant woman if too much is removed it may result in the emptying of the uterus. In any of these patients upon whom it is contemplated to operate, I believe that some measure should be taken to reduce the irritability of the uterus. I favor the use of corpus luteum extract.

There is a correlation between hyperthyroidism and hypergravidarum, but many cases that have come into our clinic have been found to be associated with both and treating the hyperthyroidism has resulted in an improvement of the hyperemesis. It is also important to realize that the hyperthyroidism is frequently associated with toxemias of pregnancy. What this relationship is is not too clear, but the increase in the end products of metabolism is obvious, we feel, which throws an extra load on the kidney and may be partly responsible for the toxemia.

I cannot quite accurately quote the number of cases that we have had in our clinic, but in general I should say that we have had about two dozen cases which would correspond pretty well with Dr. Mussey's cases. None of our patients had severe enough hyperthyroidism to require operation. One patient who entered the clinic as a hyperemesis gravidarum had a basal rate of +111, and one a rate of +109. The first case was carried through two pregnancies successfully. The latter had had therapeutic abortion for hyperemesis gravidarum at a good clinic in Chicago, and was sent to us for similar treatment, but recovered under Lugol's solution and bed rest. She was put to bed in September and we delivered the woman on February 4. Lugol's solution was stopped occasionally when the toxic symptoms would increase. There was a normal baby, and within two or three days her basal rate was down less than 10. We then sent her about six weeks later to the surgeon who had advised operation, and he said at that time that she did not need operation for exophthalmic goiter which he had said should have been done during her pregnancy.

I think it is important to realize that with careful management, by skillful surgeons, it is possible to remove parts of the thyroid gland in these patients with hyperthyroidism without producing an undue number of abortions, but that in unskillful hands there would be more abortions. It should also be remembered that with medical management a large percentage of these patients will be carried through pregnancy without aborting, without serious damage, and who will then return to a normal nonhyperthyroidism state.

DR. MUSSEY (Closing).—It occurred to me that perhaps what Dr. Falls said about thyroid activity developing in certain areas of the country may be the reason that a larger proportion of the hyperthyroid cases in the Great Lakes area can be controlled medically than we have found possible. An effort is made to control these patients with Lugol's solution, but often the rate is not controlled as one would wish: in such cases damage to the heart is quite insidious, and if one carries the patient too far on medical management the damage is irreversible. For that reason when the basal metabolism rate has been quite high and when it is brought down, one should be careful not to carry the patient too far on Lugol's solution and then find that it is no longer effective. I have a feeling that the hyperemesis in these patients was a symptom of the hyperthyroidism rather than the hyperthyroidism developed because of the hyperemesis.

## IMMEDIATE POSTPARTUM HEMORRHAGE DUE TO RETAINED SECUNDINES\*

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**E**XCESSIVE blood loss in the third stage of labor is the forerunner and the cause of much of our maternal mortality and morbidity.<sup>1-3</sup> Although age, parity, type of labor, use of instruments, and many other factors have some predisposing influence upon immediate postpartum uterine hemorrhage, we believe that the most frequent cause of postpartum uterine bleeding is faulty separation or retention of parts of the secundines. The purpose of this paper is to record the blood loss, the clinical course, and the treatment of 115 private patients in whom retained placenta, membranes, or both was the cause of the hemorrhage.

### Materials and Methods

The observations were made upon 115 private patients in whom portions or all of the placenta and membranes were retained. These cases were collected consecutively without selection. In each case the blood loss was measured and correlated with various features of the patient's postpartum clinical course.

*Method of Measuring Blood Loss.*—In collecting blood we use a thin metal plate designed for patients who are delivered in stirrups. The section under the patient is 14 inches wide and 7 inches deep with a central groove for collection and direction of blood (Fig. 1). At the table edge the plate drops 4 inches at a 45° angle. At this angle it accommodates to the give of the table pad, and yet fits the patient closely. The plate is then leveled and curbed to prevent overflow. Two openings are placed for drainage of blood and fluids. A wing guide is so attached that either opening may be closed. A 500 c.c. jar is attached at each opening.

Usually the plate is easily pushed under the patient. An Allis forceps is attached to the leg drape for use in turning the guide. After fluids start draining, neither the plate nor the forceps tip is sterile and the utility nurse must change the bottles.

Episiotomy blood is collected in jar No. 1. When the head distends the vulva the guide is turned to direct the waters, which usually follow the baby, into jar No. 2 or the floor basin. Following delivery, collection of blood is continued in jar No. 1. In case the blood loss exceeds 500 c.c., the utility nurse attaches another jar. Occasionally the plate is not placed under the patient until after delivery of the baby.

To the total amount of blood collected we add 25 c.c. to account for spill, sponges, and so forth (Fig. 2).

*Removal of Retained Tissues.*—When the uterus is not contracting properly and bleeding is continuing with no sign of abatement, we remove manually any tissue that is retained within the uterus. This may be the whole placenta and membranes or pieces of either that are responsible for relaxation of the uterine muscle. In removing the intact placenta and membranes, we follow the technique as described in textbooks. When pieces of tissue are to be removed, a double layer of gauze is arranged over the first two fingers and folded back over the thumb. This enables the operator to separate and to obtain a more secure

\*Read at the Fifty-Eighth Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Hot Springs, Va., Sept. 4 to 6, 1947.

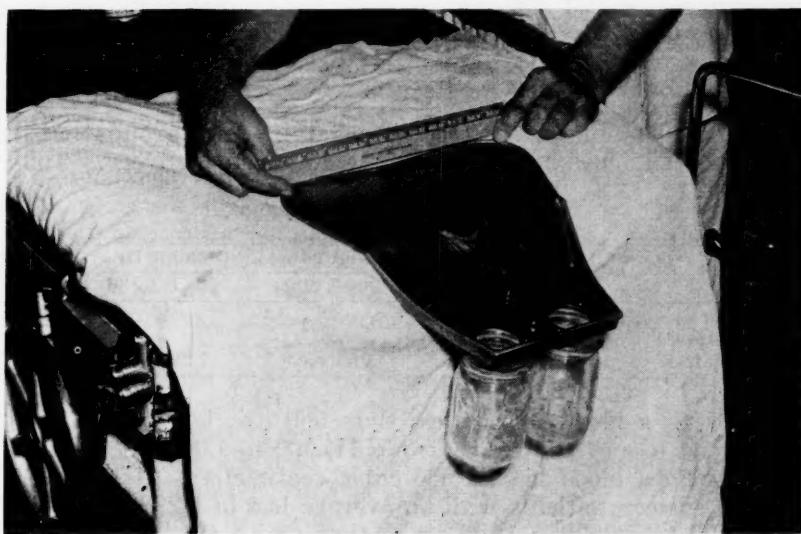


Fig. 1.—View of plate on table, showing incline, wing guide, and containers.

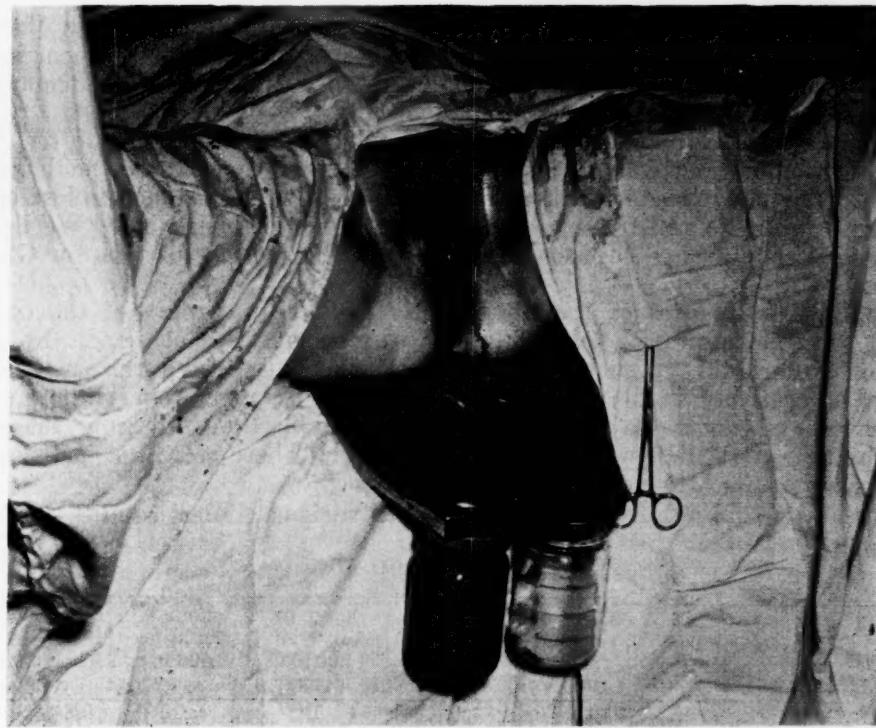


Fig. 2.—Delivery completed. Blood loss accurately measured.

grasp of the retained tissue. The hand is inserted into the vagina and the two fingers and thumb, covered with gauze, are passed through the cervix into the cavity of the uterus. Following removal of tissue, the uterine cavity is routinely wiped with gauze.

### Results

**Blood Loss.**—The patients were arranged in four groups based on the amount of measured blood lost immediately following delivery. Table I.

TABLE I. BLOOD LOSS BY GROUPS

AMOUNT, IN C.C.	GROUP I	GROUP II	GROUP III	GROUP IV
	0-500	500-1,000	1,000-1,500	1,500-2,000
No. of patients	57	39	13	6
Total—115 patients				
Average blood loss	320 c.c.	665 c.c.	1,290 c.c.	1,633 c.c.

Group I, with a blood loss of less than 500 c.c., had fifty-seven patients, averaging a blood loss of 320 c.c. Group II, 500 to 1,000 c.c., had thirty-nine patients, averaging a blood loss of 665 cubic centimeters. Group III, 1,000 to 1,500 c.c., had thirteen patients with an average loss of 1,290 cubic centimeters. Group IV, 1,500 to 2,000 c.c., had six patients with an average blood loss of 1,633 cubic centimeters.

The time after delivery when the retained tissues were manually removed was determined by the character and amount of the bleeding. In all cases, the procedure was done within thirty minutes after delivery. Group I, in which blood loss was not excessive, was composed largely of patients whose placenta was held in the cervix by adherent membranes or of patients in whom it was known that large pieces of placenta or membranes were retained. Removal of these tissues was followed by cessation of bleeding.

In Group II, where blood loss averaged 665 c.c., there was often some delay in manual removal of the tissues while more conservative methods for control were being tried. During this time the patients continued to lose blood. Removal of the retained tissue again promptly stopped bleeding. We believe these uteri should have been emptied earlier. The same holds true for Groups III and IV.

Following removal of the retained tissue and the wiping of the uterine cavity with gauze, it was found that the uterine muscle contracted. No cases of atonic uteri have been encountered following this procedure. We believe that comparatively small pieces of tissue may cause relaxation, while a clean uterine muscle contracts promptly and controls bleeding. During the puerperium the uteri underwent prompt involution. There were no cases of delayed postpartum hemorrhage.

**Clinical Studies.**—The summary of the various clinical studies is shown in Table II.

TABLE II. CLINICAL DATA

115 PATIENTS	GROUP I 0 TO 500 C.C.	GROUP II 500 TO 1,000 C.C.	GROUP III 1,000 TO 1,500 C.C.	GROUP IV 1,500 TO 2,000 C.C.	TOTAL AVERAGE
	57 PATIENTS	39 PATIENTS	13 PATIENTS	6 PATIENTS	
Shock	0	0	1	0	0.8%
Uterine pack	0	1	0	0	0.8%
Late hemorrhage	0	0	0	0	0%
Chemotherapy	1	3	2	2	8 Pts.—7%
Morbidity	0	3	0	1	4 Pts.—3.4%
Mortality	0	0	1	0	0.8%
Average hospital days	7.5	8	8	9	8

Shock occurred in one patient who had lost 1,375 c.c. of blood. She responded promptly to plasma and blood.

Only one patient was packed. This was used as an aid to support the uterus while repairing a vaginal laceration. Immediately following repair the pack was removed.

There were no cases of delayed or late postpartum hemorrhage.

Chemotherapy was used for eight patients. Sulfonamides were used four times prophylactically and combined with penicillin in four patients who had elevated temperatures. The treatment was effective in all cases.

Four patients ran a temperature of 100.4° F. on two successive days. In two of these the morbidity was attributed to pelvic inflammation, a third sustained a gastroenteritis on the sixth postpartum day and the fourth, who had lost 1,800 c.c. of blood, had pyrogenic transfusion reactions. These four patients made prompt recoveries.

The one death was due to eclampsia. Postmortem examination showed extensive acute necrosis of the liver.

The average number of hospital days was eight. The longest stay was ten days and the shortest six days. With the one exception, every patient went home after being ambulatory for two or more days.

**Transfusion.**—The percentages of cases in which transfusions were given are shown in Table III. Also the antepartum and postpartum hemoglobin findings are shown.

TABLE III. TRANSFUSIONS AND HEMOGLOBINS

	GROUP I 0 TO 500 C.C. 57 PATIENTS	GROUP II 500 TO 1,000 C.C. 39 PATIENTS	GROUP III 1,000 TO 1,500 C.C. 13 PATIENTS	GROUP IV 1,500 TO 2,000 C.C. 6 PATIENTS	TOTAL AVERAGE
Transfusion	4%	49%	100%	100%	33.0%
Antepartum hemoglobin	73%	73%	74%	74%	73.5%
Postpartum hemoglobin, 6 weeks	70%	75%	74%	74%	73.2%

There was a sharp increase in the number of transfusions in each group. Four per cent in Group I, 49 per cent in Group II, and 100 per cent in Groups III and IV. Groups II, III, and IV make up one-half of the patients, and these received 95 per cent of the transfusions. The 4 per cent transfusions in Group I were given to patients who had an antenatal anemia. Group II had a transfusion rate of 49 per cent. Many of these transfusions were not given until the second day. Although the average blood loss in this group was only 665 c.c., we feel that more of these patients should have received blood much earlier. In Groups III and IV with loss of over 1,000 c.c., the transfusion was started in the delivery room, often before the hemorrhage was controlled. These patients were not moved until their blood pressure was stabilized, the pulse rate 100 or less, and they had reacted from the anesthetic.

The slightly lower postpartum hemoglobin in Group I, as compared to the antepartum value, suggests that more transfusions were indicated and that postpartum antianemic medication was not sufficiently stressed in this group. In the remaining groups, the hemoglobin values at six weeks post partum were equal to or higher than the antepartum values.

**Nursing.**—The effect of hemorrhage on the ability of the patient to nurse is shown in Table IV.

It is of interest to note that in 68 per cent of these mothers the babies were entirely breast fed at the time of hospital discharge. From Group I to Group

TABLE IV. NURSING AT END OF EIGHT DAYS

GROUP I 0 TO 500 C.C. 57 PATIENTS	GROUP II 500 TO 1,000 C.C. 39 PATIENTS	GROUP III 1,000 TO 1,500 C.C. 13 PATIENTS	GROUP IV 1,500 TO 2,000 C.C. 6 PATIENTS	TOTAL AVERAGE
78%	69%	54%	50%	68%

IV there was a progressive decline in the ability of the patient to nurse, regardless of early transfusion. This may be the manifestation of a defense mechanism resulting from the sudden hemorrhage.

#### Discussion

We believe that accurate objective measurement of blood loss is a valuable and essential aid in obstetrics. The customary method of estimation is notoriously deceiving and inaccurate. With accurate measurement, the obstetrician will not be surprised by the sudden manifestation of a rapid pulse and falling blood pressure which occurs in the late or critical period, when postpartum blood loss has been excessive. We use accurate measurement of blood loss as an early objective sign which sharply identifies the condition of the patient and also justifies early removal of retained tissues to control uterine bleeding. With our plate, 500 c.c. jars are used. When 500 c.c. of blood have been collected, the operator must realize that his patient is now in the abnormal or danger zone.

Our studies show that blood loss over 500 c.c. is associated with an increased number of clinical complications. With one exception the morbidity, mortality, shock, and need for chemotherapy occurred in patients who had lost more than 500 c.c. of blood. Moreover, blood loss over 500 c.c. was associated with a decreased ability of the mothers to nurse their infants. These findings emphasize the need for accurate objective measurement and control of blood loss during delivery and immediately post partum.

In each of the 115 cases studied we found the bleeding associated with retention of placenta or membranes or both. In Group I the entire placenta or large portions of it were retained. In the remaining groups smaller pieces were retained. In Group I the evidence of retained tissues was more obvious. Consequently, they were removed earlier with the resultant relatively low blood loss in this group. In the remaining groups the retention of secundines was manifested by continual blood loss, often augmented by spurts on contraction and pressure.

When pieces of placenta and/or membranes are retained, when blood loss exceeds 500 c.c., and when the uterus fails to contract, we feel that manual removal of retained tissue is indicated. We wish to emphasize that manual removal should not be practiced routinely or indiscriminately. We believe that standard procedures in the conduct of the third stage of labor, such as administration of pituitrin following delivery, gentle massage of the uterus, and occasional modified Credé should always be followed. In the presence of hemorrhage when these measures fail, manual removal of retained tissues will allow the uterus to contract properly and arrest bleeding.

In our cases manual invasion of the uterine cavity was not associated with a high incidence of morbidity. Infection of the uterine cavity did not follow this procedure and we feel, as others have found,<sup>4, 6</sup> that infection is more likely to develop where retained pieces of tissue are left in the uterus.

A real and noticeable clinical response was observed when the blood loss was promptly replaced. Thirty-three per cent of the patients were transfused. Yet we feel more transfusions could have been given with benefit. The therapeutic action is both prophylactic and curative.

### Conclusions

1. Accurate measurement of postpartum blood loss, as studied in 115 patients, was found to be a reliable, informative procedure. Measurement furnished an early and valuable objective sign for use in the treatment of immediate postpartum uterine bleeding.
2. Retained tissue was the cause of the immediate postpartum uterine hemorrhage in all of these cases. Early manual removal of this retained tissue permitted normal contraction of the uterus and arrested hemorrhage.
3. No ill-effects were noted from early careful invasion of the uterus.
4. An accurate knowledge of excessive blood loss demands early and more frequent transfusions.

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### Discussion

DR. R. GORDON DOUGLASS, New York City.—During the past two decades mortality caused by various types of toxemia has shown a progressive decrease. The incidence of eclampsia is now only a fraction of what it was formerly. Prophylactic and early employment of chemotherapeutic agents has eliminated to a large extent serious illness caused by puerperal infection. The third of the triad of major causes of maternal mortality, i.e., hemorrhage, now constitutes the most important cause of maternal morbidity and mortality.

The treatment of hemorrhage from the point of view of both control and restoration of blood volume has also been improved. Transfusion has been made a safer procedure by the establishment of blood banks and newer techniques of compatibility. It is, however, undoubtedly true that transfusion and the control of hemorrhage are often commenced too late.

Dr. Carroll and his associates are to be complimented on reviving interest in the accurate measurement of blood loss during the latter part of the second stage of labor and during the period following the birth of the baby. During the month of August Dr. Carroll's apparatus was employed in seventy unselected cases delivered in the New York Lying-in Hospital; fifty-seven of these patients could be classified in the author's group I, with an average blood loss of 213 c.c.; twelve were in group II with an average blood loss of 645 c.c.; and one was in group III with a loss of 1,235 c.c. It is significant to note that the measured blood loss nearly always exceeded, and on occasions greatly so, the estimated loss. This error was not confined to the junior members of the staff.

The early signs of shock are frequently preceded by a period of procrastination when inadequate measures are employed to combat bleeding. On too many occasions during con-

sistent, but what appears to be insignificant bleeding, the doctor assumes an attitude of expectancy steadfastly maintaining confidence in the physiologic function of the uterus. The most experienced and capable individual will, at times, underestimate blood loss until heroic measures become necessary.

The author's apparatus is simple to employ, measures accurately and, most important, the amount of blood lost at any given time is immediately apparent.

I agree with Dr. Carroll that early intervention by manual removal of retained products, when bleeding persists, should be performed before an excessive blood loss occurs. Intravenous ergonovine during the procedure has in my opinion aided in the prompt retraction and contraction of the relaxed uterus.

In my brief experience with Dr. Carroll's apparatus minor disadvantages have become apparent. First, it is somewhat cumbersome to handle, and also adds another procedure from a nursing point of view in cleansing and sterilizing. Second, the 4-inch drop at an angle of 45° brings the plate in such a position that it may interfere with downward traction such as may be necessary in delivering the shoulders, during some forceps operations and breech extractions. The first objection cannot be sustained validly, while the second could be corrected without detracting from its value by a modification in design. Minor structural changes, if produced commercially, would prolong its period of usefulness.

Shock is a relative term. The authors record nineteen patients with a blood loss of more than 1,000 c.c., and in six of those cases the loss exceeded 1,500 c.c., yet they report only one patient manifesting signs of shock. It would appear to me that if a more liberal interpretation of the term were employed, many more patients would have been classified as having shock. With a more realistic approach and the early application of remedial measures based on up-to-the-minute information on blood loss, the number of patients in impending shock should be greatly reduced.

The reported morbidity (3.4 per cent) in a group of patients where manual removal of retained products was necessary is exceptionally low. If temperatures were recorded every four hours during the observed period of the puerperium the figure becomes even more significant. If patients were classed as morbid who had an elevated temperature on any two days rather than consecutive days, the morbidity would undoubtedly be considerably higher.

The number of patients in whom prophylactic or therapeutic chemotherapeutic agents were employed was small. The authors are reporting on their personal experience with private patients. On a ward service with young and less experienced operators I feel confident that these agents should be employed more frequently.

The relatively low hemoglobin percentage reported both ante partum and post partum is somewhat surprising. The low antepartum determinations might be explained on a basis of hydremia, however, this explanation would not account for the low reading six weeks post partum. It would appear that the more liberal use of transfusions as suggested by the essayist, and iron therapy during pregnancy as well as following delivery, might have improved these results.

I would like to emphasize again the advantage of the authors' simple apparatus that efficiently records blood loss that is at all times apparent. Pastore has described an apparatus that is accurate and meets these requirements. Its routine employment, however, is limited by its complexity. The use of any device for this purpose may appear cumbersome and in many instances unnecessary. I am, however, completely in agreement with Dr. Carroll that if used routinely the unpredictable hemorrhage can be detected earlier than is otherwise possible and remedial measures employed before the life of the patient is endangered.

DR. G. D. ROYSTON, St. Louis, Mo.—I agree with Dr. Douglass that the actual blood loss is often greater than is supposed to occur, for too many of these patients are treated by watchful hopefulness and too much time is lost before active treatment is instituted.

I was rather surprised at the high percentage of hemorrhages occurring in these cases, and that nothing was said about the cause of them except the retention of products. In the Washington University Clinic where we employ all forms of analgesia, we feel very definitely

that the anesthetic employed has a very definite bearing upon the amount of blood loss. We have found that ether is the most common offending agent, that either not enough was given to relieve pain or else too much was given. For the purely normal case we usually employ chloroform, and we feel that more attention should be given to teaching anesthetists how to give it properly instead of scaring them to death and drowning the patient with an anesthetic when an obstetric dose is all that is needed.

DR. JAMES K. QUIGLEY, Rochester, N. Y.—I believe that Dr. Carroll's paper is particularly valuable today, for if we are to look for a lowered death rate it must come from the cases of hemorrhage. In a statistical study for twelve years we have found that deaths from most causes including sepsis and toxemia are pretty well controlled, but deaths from hemorrhage have not decreased. An accurate determination of blood loss is important. The apparatus I use is a very simple plate, not as elaborate as Dr. Carroll's. We simply slide that under the patient and then wheel around a liter glass jar to measure the blood loss. The value of an accurate measurement of blood loss is that we can anticipate the necessity for blood replacement. Symptoms of blood loss such as rising pulse and falling blood pressure lag behind the actual loss, and if we depend upon symptoms alone, we will often find that the most valuable time has passed in which to give transfusions. Williams said the most common cause of postpartum hemorrhage was mismanagement of the third stage of labor. We had two cases in our twelve-year study in Rochester where one patient died in forty minutes and the other in about thirty minutes, in which time the fundus had ballooned, because it was not watched. I think we sometimes hesitate too long to invade the uterus if there is any question of retained tissue, and Dr. Carroll's paper has shown that there is little danger in removal of retained secundines.

DR. EDWARD L. CORNELL, Chicago, Ill.—I believe the greatest cause for postpartum hemorrhage is watchful neglect: manipulating the uterus immediately after delivery of the baby, neglect in using pituitrin and/or ergotrate, and waiting to see how much the patient is going to bleed before determining to interfere. I think the technique should be pituitrin as soon as the head is born, ergotrate as soon as the body is born, and leaving the uterus alone without manipulations. As soon as the baby is separated and the patient shows any signs of bleeding, the uterus is entered or the placenta is removed from the vagina either by early extraction or a combination of early extraction and manual removal. It is a great mistake to wait to see how much blood the patient is going to lose before one interferes. If your hospital technique is good the chances of getting infection of the uterus is minimal. If your patients are becoming infected after invading the uterus, there is something wrong with your technique at the hospital.

DR. IRVING W. POTTER, Buffalo, N. Y.—I was very glad to hear Dr. Royston speak as he did about the anesthetic, and I was particularly pleased to hear him speak so frankly about chloroform. We must teach these young men to come back to its use. We all know about the use of ether.

One other feature has not been mentioned today which is very important. It is that these patients are kept under an anesthetic altogether too long. I mean they are brought into the operating room or the delivery room thoroughly anesthetized, and that procedure has been carried out in an anteroom and no one knows how long she has been under the anesthetic. If the operator will tell his anesthetist not to start the anesthetic until he is ready, he will have very much better results with the anesthetic and fewer times that he will be worried about his patient. Let the anesthetist wait for you to start.

DR. JAMES R. BLOSS, Huntington, W. Va.—I would like to ask Dr. Carroll what he used for the preliminary analgesia. Also, how many of these patients had caudal or spinal block?

DR. LEROY A. CALKINS, Kansas City, Kansas.—I agree with Dr. Carroll in every single particular that he has brought out, and I want also to emphasize what Dr. Royston

and Dr. Potter have said. I think we have paid far too little attention to that phase of blood loss in the third stage of labor.

Further, I would like to amplify what has been said by several speakers with reference to this question of estimation of blood loss. The "estimator" cannot accurately estimate blood loss. He can, however materially improve the accuracy of his observations if he will, every six weeks, conduct an "estimation quiz." Someone in our group takes three sheets, on which there is a known amount of blood on each, and the rest of us try to estimate that amount of blood.

**DR. CARROLL (Closing).**—We have tried to limit this paper to a discussion of postpartum bleeding due to retained tissue. As stated, postpartum uterine bleeding may be influenced by other causes. The anesthetic used may be a contributing factor in hemorrhage. Most of these patients received nembutal and demerol as an analgesic and were delivered under ether or nitrous oxide and oxygen anesthesia. A few cases were delivered under caudal or low spinal. We could not directly associate faulty separation of the secundines and bleeding with any anesthetic agent.

Ergotrate was given routinely after delivery of the placenta. There were no cases of delayed or late postpartum hemorrhage in this group of patients.

The state of impending shock is difficult to identify. We feel that when a patient has lost 500 c.c. of blood she is definitely in the danger zone. If the blood loss reaches 700 c.c. we give plasma immediately. In this group of patients, whose blood loss was between 500 and 1,000 c.c., 49 per cent were transfused. If the patient loses 1,000 c.c. of blood, she is routinely transfused.

We wish to point out the importance and practicability of measuring blood loss and its relation to treatment of the patient. The method used for measuring is optional.

## FACTORS IN THE TREATMENT OF CHORIONEPITHELIOMA\*

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OUR recent study of hydatid mole and chorionepithelioma on the Pacific Coast convinced us that there is confusion in the minds of many physicians as to the relationship of these two conditions, and as to the best methods of treating them. This doubt springs primarily from ignorance concerning the origin and course of hydatid mole and of chorionepithelioma; and is accentuated by vague pathologic classification and terminology.

Adenoma, adenoma destruens, chorio-adenoma, chorioma, chorionepithelioma, carcinoma, Ewing's syncytial tumor, malignant chorionepithelioma, penetrating adenoma, malignant mole, syncytoma, and syncytial endometritis are terms used by physicians in answer to questionnaires in our recent survey.

Chorionepithelioma is a misleading term and should be discarded. Epithelioma is applied to carcinoma of dermoid origin and, through usage, has become attached to epidermoid carcinoma. Chorionepithelioma is really choriocarcinoma and, depending upon rapidity of growth, cell type, pattern and invasiveness, should be called choriocarcinoma, Grades I to IV.

Choriocarcinoma is a malignant change of the trophoblastic tissue; both the Langhan's and syncytial layers may be involved.

Synctial cells persisting after miscarriage or full-term pregnancy in sufficient quantity to give a persistently positive Friedman test, must be considered as potentially malignant and should be called choriocarcinoma, Grade I.

The comparative rarity of hydatid mole and extreme rarity of choriocarcinoma are also responsible in large part for the lack of early diagnosis. It is axiomatic that one never can make a diagnosis of any condition unless he has that condition in mind. The presence of hydatid mole is rarely suspected until the vesicles are passed, because the physician does not have the possibility of mole in mind when he sees a patient who is bleeding during her pregnancy. Very early hydatid moles also may be missed because of casual and incomplete examination of placental tissues by pathologists.

The possibility of choriocarcinoma is rarely suspected in a woman who bleeds after an abortion or a normal pregnancy because the attending physician does not have that condition in mind.

Hydropic degeneration can occur in the chorionic villi of any pregnancy and is responsible for many abortions. For this reason alone, every patient who has a miscarriage in the first trimester of pregnancy should have her uterus curetted, and the curettings should be examined microscopically so that the early abortion of a hydatid mole will not be overlooked, and a beginning choriocarcinoma exist unsuspected.

About 10 per cent of hydatid moles are followed by choriocarcinoma, according to most writers. Novak gives a figure of 1 to 2 per cent. The reason for this difference is due to the fact that many so-called chorionepitheliomas are not malignant. Hence, Novak's figures are more nearly correct. Every patient who

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passes a hydatid mole must be suspected of harboring a choriocarcinoma. After a woman has passed a mole, she should be curetted immediately. If there is bleeding after passage of a mole, the need for curettage is particularly important. The curettings should be examined for choriocarcinoma. Negative findings from curettage mean nothing, and the urine of the patient should be examined for chorionic gonadotrophic hormone by the Friedman test after ten days. Every two weeks thereafter, for two months, her urine should be subjected to a Friedman test. After this seventy days has passed, an examination of the urine should be made each month until a year has intervened since the passing of the mole. It goes without saying that any positive report must be confirmed and a new pregnancy ruled out. Only by this procedure can early diagnosis of postmolar choriocarcinoma be made.

Hydatid mole and choriocarcinoma are associated in the minds of many physicians to such an extent that they cannot think of one without the other. Many believe choriocarcinoma to follow hydatid mole in a much greater percentage of cases than it does, and have the mistaken idea that choriocarcinoma is such a common sequel to hydatid mole that they perform routine hysterectomies whenever the diagnosis of hydatid mole is made. Many never suspect the presence of choriocarcinoma unless there has been a preceding hydatid mole.

One obvious fact that seems to be little known is that any pregnancy, terminating early or at term, can be associated with or followed by choriocarcinoma. In our study, we found that more of the fatal choriocarcinomas followed abortions or full-term pregnancy than followed hydatid mole. One reason for the increase in mortality in these cases was that much more time elapsed before a diagnosis of choriocarcinoma as made than when the malignancy followed hydatid mole.

The primary, the most frequent, and the cardinal symptom of both hydatid mole and choriocarcinoma is bleeding. Any bleeding during pregnancy or other signs of threatened miscarriage must cause the thought of hydatid mole to be borne in mind. Likewise, any bleeding following miscarriage or pregnancy must also cause choriocarcinoma to be suspected.

When bleeding occurs during pregnancy, obviously the preliminary diagnosis of hydatid mole or of choriocarcinoma will be correct only a very few times and can only be an inferential one at best. The fear that manipulation might cause miscarriage should not prevent examination with a speculum. Vesicles in the vagina or carcinoma of the cervix might otherwise be overlooked. Quantitative Friedman tests are an added refinement in diagnosis, but in many localities cannot be performed because of the lack of trained technicians. The expense, too, of quantitative tests makes them prohibitive in all but the exceptional instance. It has been shown that normal pregnancies have a sudden high peak of urinary hormone one month after the first missed period. An increasing chorionic hormone content of the urine after this time, or one that does not decrease is very indicative of the presence of a hydatid mole or choriocarcinoma. Vesicles passed from the vagina verify the diagnosis of hydatid mole.

Too much importance has been attached to excessive enlargement of the uterus in the diagnosis of hydatid mole. In our study, the majority of patients with mole did not have a uterus enlarged beyond the period of pregnancy. We

agree with Mathieu in his condemnation of hysterotomy in the diagnosis of and curettage in the treatment of choriocarcinoma. In postmolar cases with positive Friedman tests and without bleeding, curettage is unnecessary for diagnosis and should give way to immediate hysterectomy. We found that, in fifty-five cases with positive Friedman tests, curettings agreed in only twenty-four. This is a serious indictment against curettage as a diagnostic procedure.

In one of our own cases and several found in our study, the original choriocarcinomas were several millimeters under the endometria, in the bodies of the uteri, and curettage could not have reached them. Hysterectomies were done because of persistently positive pregnancy tests following the passage of moles, and the patients' lives were saved as a result. However, in patients with postmolar bleeding, postabortal bleeding, or postpartum bleeding, curettage with examination of the curettings might be a valuable diagnostic aid. It can be done while awaiting the result of a Friedman test, and might be the means of saving valuable time in making a diagnosis because, if frozen sections should reveal choriocarcinoma to be present, an immediate hysterectomy could be done to great advantage.

Negative findings from curettage mean nothing. There is a real danger of uterine perforation with alarming hemorrhage in instances where the choriocarcinoma is of any extent. Seven cases were found, in our study, where the uterus had been perforated by the curette in the presence of choriocarcinoma; four of these patients died of resulting hemorrhage.

The ultimate clinical diagnostic method for choriocarcinoma is the biologic pregnancy test and, if this test is positive two weeks following pregnancy or the passage of a mole, hysterectomy should be performed. This dictum, however, has one exception. In those cases of hydatid mole which are associated with large lutein cysts of the ovary, it is possible to have a persistently positive pregnancy test due to the excretion of the gonadotrophic hormone which has been retained in the ovarian cysts. Some writers say that the pregnancy test is positive for six weeks after the passage of some moles. In the absence of palpable lutein cysts, we feel two weeks is the limit of safety.

Mathieu has said: "Just as in acute appendicitis and ectopic pregnancy, all patients (with chorionepithelioma) should be operated upon as soon as the diagnosis is made in order to obtain the best results and serve the common good. In a few cases in the literature it appeared that the uterus had been removed needlessly, but these cases are rarities and need have no effect in controlling our conduct. Surgeons who attach too much importance to the loss of the uterus are likely to neglect the common good. While there is occasionally an argument from a pathologist that certain lesions of chorionepithelioma might have regressed and thereby hysterectomy have been prevented, I do not believe that we should let the occasional negative pregnancy test or the occasional instance of regression, both of which are rarities, dominate the situation. I am sure that waiting for regression of the chorionepitheliomatous lesion does not constitute one of the factors responsible for the lowered mortality rate obtained at the present time. In this study of the literature, it was almost invariably found to be true that when the disease was diagnosed early and hysterectomy performed immediately, the patient was cured; and that, on the other hand, the deaths were recorded almost invariably among the cases in which there was either delay in diagnosis and treatment or in which the disease was of long standing."

Hysterectomy may be either total or subtotal, depending upon involvement of the cervix by the choriocarcinoma. If the cervix is not involved by the growth, it does not need to be removed.

X-ray of the lungs should always precede hysterectomy for choriocarcinoma because pulmonary metastases are frequently present before they are suspected and, if recognized early, may be treated by x-ray. Choriomatous tissue is particularly susceptible to x-ray. It has been stated that frequently metastases would disappear spontaneously after the parent tumor was removed. We found no evidence of this in our study and do not believe it.

The ovaries should be removed only when involved by the primary growth, or by metastases, or when the lutein cysts are so large that they are mechanically objectionable. In such an instance, the patient's age would be the deciding factor as to whether large lutein cysts should be removed. After the removal of the tumor which stimulated the lutein cysts, they will regress. When large lutein cysts of the ovaries are found, the presence of a trophoblastic tumor must be suspected. It is to be remembered that choriocarcinoma metastasizes through the blood stream and by direct extension. As a result of this method of extension, the ovaries are rarely involved in the growth, and a young woman in the childbearing age should not be castrated needlessly merely because her uterus happens to be the site of a choriocarcinoma. As far as we have been able to determine by study and from the literature, ovarian hormones play no part in the life of choriocarcinoma metastases.

The vagina and vulva should be examined carefully before hysterectomy because metastases to the vagina frequently occur very early and, in several cases in our study, vaginal metastases were the first sign of choriocarcinoma.

Mathieu stated, in his review of the literature, that early diagnosis of choriocarcinoma followed by hysterectomy was responsible for 95 per cent recovery in patients with choriocarcinoma. Novak takes exception to this statement.

The word, early, must be defined. Trophoblastic tissue is normally rapidly growing and invasive. Malignant trophoblastic tissue such as choriocarcinoma is particularly rapidly growing and invasive. Hence, what would be early treatment for ordinary carcinoma would not be for choriocarcinoma.

One hundred seven cases were reported to us classified under one or another of the terms mentioned earlier.

We arbitrarily set four months after the beginning of symptoms as the dividing line between early and late treatment. Where choriocarcinoma followed mole, the symptoms were considered to have started with the initial bleeding or with the passage of vesicles, whichever occurred first.

Where choriocarcinoma followed abortion, or full-term pregnancy, the symptoms were considered to have started either with the original bleeding or with the passage of the product of conception, whichever occurred first.

In the sixty-seven cases following mole, the mortality was roughly 15 per cent in both the early and the late group. In the forty cases following abortion or full-term pregnancy, the mortality in both groups was roughly 40 per cent. There were not enough cases, either after mole or otherwise, treated within two

months or earlier to give dependable figures; but that is the time that hysterectomy must be performed if the patient is to be given the best chance for life.

We feel that a distinction should be made between early diagnosis following the first symptom and early diagnosis following the inception of the tumor. In those cases where the choriocarcinoma started from a nidus deep in the uterine musculature, one can see that it could be a number of months after the choriocarcinoma started before the endometrium was enroached upon and bleeding resulted. Therefore, in such an instance, the diagnosis could have been made early following the first symptoms, but would have been late after the beginning of the tumor, and metastases might already have been present. Hysterectomy, in such an instance, cannot be expected to cure the patient. However, if such a patient had had the benefit of Friedman tests early, choriocarcinoma would have been suspected early; the uterus would have been removed while the growth was still localized; and the patient's life saved.

Early diagnosis means early diagnosis after inception of the tumor, not after the first symptom. In one of the cases encountered in our fifteen-year study, the patient had her first symptom thirty days after a full-term pregnancy. Biologic pregnancy tests were performed and verified and a hysterectomy was done immediately. The patient succumbed to pulmonary metastases. In retrospect, it is easy to see that this choriocarcinoma started early in the woman's pregnancy and was far advanced by the time the child was born. This was a case of early diagnosis after the first symptom, but late diagnosis following origin of the tumor.

Novak has justifiably criticized the figures in the studies published by Mathieu and Holman. He contends that some of the cases reported to us in answer to our questionnaires were not choriocarcinomas, and hence that the mortality figures are not correct. He is right. We have had to take the diagnosis of various pathologists for our reports. Some of these pathologists have had little or no experience with proved choriocarcinoma.

We hope that the Albert Mathieu Memorial Chorionepithelioma Registry, initiated by the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, will stimulate interest in the subject of choriocarcinoma.

If pathologists and clinicians will send tissues and histories of all suspected cases of choriocarcinoma to the registry, a valuable museum will be created. Increased experience will be gained in the study of choriocarcinoma. That experience will be reflected in better and more accurate figures concerning diagnosis and treatment of this most malignant tumor.

### Summary

Confusion exists in the minds of many physicians as to the relation between hydatid mole and chorionepithelioma, due, in part, to vague and misleading pathologic classification. Classification of chorionepithelioma should be clarified, the word chorionepithelioma discarded and choriocarcinoma, Grades I to IV, used to replace it. Negative findings from curettage do not mean absence of choriocarcinoma. The biologic pregnancy test is the most valuable diagnostic aid. Choriocarcinoma following pregnancy or abortion is more often fatal than when following hydatid mole. Early hysterectomy is the best treatment for

choriocarcinoma; the type of operation having no effect on the mortality rate. Oophorectomy is unnecessary unless the ovaries are involved by the growth. The newly established Chorionepithelioma Registry will help in the study of this tumor and, in time, should contribute toward earlier diagnosis.

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### Discussion

DR. EMIL NOVAK, Baltimore, Md.—Dr. Holman's late lamented Chief and colleague, Dr. Mathieu, was for many years deeply interested in this subject of chorionepithelioma, and made very valuable contributions to the subject. It was Dr. Holman's very generous gift to the Association which has made possible the Mathieu Registry, and I heartily endorse the plea he has made to you for your further cooperation in the work of this Registry.

With almost all of the statements made I fully agree. In the distinction between these benign and malignant trophoblastic growths we should always remember that even the trophoblast of a normal pregnancy possesses many of the characteristics which we associate with malignancy. When the egg makes contact with the uterus, its touch is the kiss of death, so to speak. It destroys the epithelium and the underlying tissue and it is this which permits the trophoblast to be invaded. It continues to grow and to destroy, penetrating the blood vessels and setting free the blood which is to fill the intervillous spaces. A physiologic form of metastasis even occurs, so that trophoblast and even clumps of villi are broken off in the vessels and transported to the lungs.

Pathologists should have no difficulty in differentiating between a frankly benign mole and a frankly malignant chorionepithelioma. However, there is a form of hydatidiform mole which penetrates the blood vessels deeply, often extending through to the peritoneum and sometimes causing serious or fatal intra-abdominal hemorrhage. And yet a mole of this type may not differ histologically from one of the usual benign type, in which the penetrating tendency is far more restrained. In other moles, without such extreme vascular penetration, the trophoblastic proliferation may be so marked as to make the pathologist suspect chorionepithelioma.

It is to this intermediate group that there have been applied such designations as "malignant mole" or chorioadenoma destruens. The latter term, suggested by Ewing, has always seemed to me to be a very poor one, although it is widely employed.

There is one factor, histologically intangible, which should never be lost sight of in the evaluation of this group of lesions. I refer to the defensive mechanism of the maternal tissues, commonly attributed to the decidua, though we know nothing as to its nature. It is this which holds the encroachment of trophoblast in check in normal pregnancy, and it is probably a countercharge of this defensive force which may even throw off a chorionepithelioma, a good many such instances of spontaneous regression having been reported.

In the diagnosis of this group of lesions, the microscope is the final arbiter, and no case of chorionepithelioma can be diagnosed on the basis of biologic tests alone. It was on

this point that I took issue with the conclusions of Mathieu and Holman, in their publication of some years ago. Since this study did not include any microscopic investigation, I did not see any valid basis for the diagnosis of chorionepithelioma in most of their large series of cases. Nor can biological tests of any sort in themselves distinguish between a hydatidiform mole and a chorionepithelioma.

If, after the apparently thorough evacuation of a mole, the hormone titer remains high, perhaps for a good many months, a hysterectomy is indicated, but the removed uterus will in most cases not reveal a chorionepithelioma, though of course it occasionally may. Much more frequently, in my experience, it will show residual hydatidiform villi, often with marked trophoblastic proliferation, deep in the maternal vessels, where they are inaccessible to the curette, but keep up the production of large amounts of the chorionic hormone. It appears, therefore, that a good many hysterectomies must be done, and justifiably, for benign lesions to make sure that no case of malignant chorionepithelioma is missed. While residual molar tissue of this deeply lying type would probably regress, there is a definite chance that it may later give rise to an intramural chorionepithelioma, and this is further justification for the hysterectomy.

Finally, I have seen many cases of normal pregnancy in which chorionepithelioma had been diagnosed, because of extensive trophoblastic infiltration of both decidua and muscle wall, though large numbers of such infiltrating cells are often seen in the most normal pregnancy. After delivery, many of these cells, chiefly syncytial, may remain, often giving rise to "syncytial endometritis," which is not a neoplasm at all.

Finally, I wish to endorse Dr. Holman's plea for cooperation by the Fellows of this Society in the work of the Chorionepithelioma Registry.

**DR. BERNARD J. HANLEY, Los Angeles, Calif.**—Dr. Holman asked me to review our cases of chorionepithelioma at the Los Angeles County Hospital for the past fifteen years. The following is a summary:

We had had twenty-four cases diagnosed as chorionepithelioma; of these eleven are known dead, of whom ten were autopsied at the hospital and the diagnosis proved. One other patient died on the operating table from a spontaneous rupture of the uterus. Of the thirteen remaining patients that were alive, it is probable that one is now dead, inasmuch as she had metastatic nodules in the lungs and her Friedman test was positive when last seen. In a review of the microscopic sections still available nine had a syncytial invasion of the myometrium. These cases are probably not malignant and should not be classified as chorionepithelioma unless the malignancy be graded as Dr. Holman has suggested. If these nine cases are eliminated from our series it leaves fifteen cases of proved chorionepithelioma, of whom twelve are dead, a mortality of 75 per cent, which is about what one would expect in handling this highly malignant condition.

**DR. FREDERICK H. FALLS, Chicago, Ill.**—Dr. Novak's remark that the defense against this tumor is local may remind one of the work of Abderhalden and his test for pregnancy which depends upon the presence in the blood stream of an increase of the proteolytic ferment. When it was decided that this increase could be used as a test for pregnancy, he was not correct in thinking that the proteolytic ferment were specific, although they were responsible for the disintegration and the destruction of these so-called benign metastatic bits of placental villi which got into the circulation and are so frequently found in the lungs of normal women after delivery. I believe that this mechanism is part of the defense against chorionepithelioma; that if we knew how to increase this proteolytic ferment content of the blood we would then be able to combat this disease, even after the tumor cells have gone through the uterus.

I also would like to record a case we had in Chicago a few years ago—a woman about four months pregnant who had a hydatidiform mole and in whom the uterus was emptied by abdominal hysterotomy. At operation it was found that there was a chorionepithelioma which had already penetrated the uterus and involved the broad ligament.

## INFLUENCES OF POSTURE ON THE URINARY TRACT IN PREGNANCY

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BASED upon the clinical observation that many patients received rather prompt relief from pyeloureteral pain by having the foot of the bed elevated about 15 degrees, it seemed worth while to investigate the possible influences of posture on the urinary tract in pregnancy. Adequate antibacterial agents, particularly the sulfonamides, have greatly reduced the morbidity and mortality due to pyelonephritis. However, the anatomic, physiologic, and mechanical factors which predispose the pregnant patient to urinary infections have not been changed by medications. These factors continue to deserve consideration in prevention, as well as in correction, of urinary disease.

Beginning in 1941, elevation of the foot of the bed became a part of the treatment of practically all prepartum patients admitted to Gallinger Municipal Hospital with symptoms and signs of pyelonephritis. During the five-year period from 1941 through 1946, 113 patients were treated for upper urinary tract infections complicating pregnancy. Ninety-six patients had prepartum urinary infections, and seventeen first developed symptoms in the postpartum period. This complication was present in less than 1 per cent of the 17,426 patients admitted to the Obstetric Division.

Pregnancy has been found to produce certain physiologic and pathologic changes in the urinary tract. Placental and growth hormones associated with pregnancy cause bilateral hypertrophy and hypoperistalsis of all musculofascial structures of the urinary system.<sup>1-9</sup> Some gestational factor, either anatomic or mechanical, usually brings about more dilatation of the right than of the left ureter.<sup>10, 11</sup> The abdominal portion of the ureter undergoes the greatest amount of dilatation and tortuosity, whereas the most hypertrophy of the ureteral wall is demonstrable in that portion adjacent to and penetrating the bladder.<sup>3, 12-14</sup> Practically all authors recognize stasis as a predisposing element to infection of the urinary tract in pregnancy. In addition, it is an interesting observation that bipeds develop more urinary tract problems in pregnancy than other mammals,<sup>15</sup> and that pyelitis in the female occurs most frequently in childhood or during the period of gestation.<sup>16</sup>

### Possible Postural Influences

As a plan for evaluating the importance of posture on the urinary tract in pregnancy, the following questions formed an outline for the present study:

1. Do changes in posture alter the position of the kidneys or change the contour of the abdominal ureters in pregnancy?

Read at the Fifty-Eighth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Hot Springs, Va., Sept. 4 to 6, 1947.

2. Does fetal position have any influence on ureteral dilatation?
3. What changes occur in the pelvic portion of the ureter as a result of changes in position?
4. Does posture contribute to the predominance of right-sided dilatation?
5. What anatomic relations of the ureters influence their physiologic and pathologic changes?
6. Does the gravid uterus cause a shift in body fluids which in any way alters urinary excretion?

#### Procedure

Serial pyeloureterograms, taken with the patient in various positions, seemed the best means of demonstrating the influences of posture on the urinary tract in pregnancy. Certain limitations in pyeloureterography have always been present. Roentgen visualization of the bladder, kidney pelves, and abdominal ureters is easily accomplished either by intravenous or retrograde pyelography. It is much more difficult to demonstrate the contour of the pelvic portion of the ureters in pregnancy.

In an attempt to visualize the entire urinary tract, particularly the pelvic part of the ureters, consideration was given to the use of bulb-retention ureteral catheters which would permit filling the full length of the ureters. Such catheters have been devised by Kreutzman,<sup>17</sup> but in recent years they have not been available. In order to produce as little distortion as possible of the pelvic ureters, the next best method seemed to be the insertion of soft number four catheters to a level with the pelvic brim. With the catheters in place, and following the injection of 20 c.c. of skiodan, pyeloureterograms were taken of each patient in the following positions: (1) supine; (2) with 15 degree elevation of the foot of the table; (3) with 15 degree elevation of the head of the table; (4) in the right oblique; and (5) in the left oblique position. Twenty-four patients who had recovered from the acute symptoms of pyelonephritis of pregnancy were studied in this manner. Each patient was placed on the cystoscopic table, in lithotomy position, with focus of the perpendicularly fixed roentgen tube as nearly as possible on the same area to prevent distortion of anatomic landmarks. As a rule, only the suprapelvic portion of the ureters and the bladder filled with the contrast media. The course of the pelvic ureters had to be determined by visualization of the small, indwelling ureteral catheters. From these pyeloureterograms, evaluation was made of the amount of upward and downward displacement of the kidneys and ureters brought about by changes in posture.

The next part of the study was carried out on another group of six patients who were known to have pyelonephritis in late pregnancy. With the foot of the table elevated 15 degrees, the kidney pelves and ureters were filled by retrograde injection with 20 c.c. of skiodan bilaterally. The catheters were immediately withdrawn and serial pyeloureterograms were made at five-, fifteen-, thirty-, and sixty-minute intervals. Four days later, the same patient received a similar retrograde injection of skiodan with the head of the table elevated 15 degrees, and comparable exposures were made. The beginning posture was alternated with every other patient. In this manner, the influence of posture on the dilution and emptying time of the dilated kidney pelves and ureters was determined.

A third method of examination was focused on the course of the pelvic ureters. Oblique exposures had failed to give as much information as desired about the ureter below the pelvic brim. In an attempt to determine what influence position might have upon anterior-posterior rotation, as well as upon upward and downward displacement of the ureters, stereoscopic roentgenograms were made with the patient standing and in 15 degree Trendelenburg position.

Findings demonstrated by the five patients who have thus far been examined stereoscopically will serve as a preliminary report on ureteral rotation.

While it has been impossible by present methods of investigation to evaluate changes in the caliber of the pelvic ureters, certain changes in position of the ureters with changes in posture have been demonstrated. The theoretical influence of these changes in ureteral position will be discussed under separate subject headings.

### Mobility of the Kidneys and Abdominal Ureters

The findings of Woodruff and Milbert<sup>11</sup> and the x-ray evidence in this study indicate that kidney mobility is not influenced greatly by pregnancy. If altered at all, the kidneys are supported by the gravid uterus and are less mobile than in the nonpregnant patient. The degree of ureterectasis between the pelvic brim and the kidney pelvis does not change with alterations in position. It seems that posture has no direct influence on the position of the kidneys or upon the contour of the abdominal portion of the ureters in pregnancy.

### Fetal Position and Ureteral Dilatation

With regard to fetal position in relation to ureteral dilatation, our findings are in accord with those of Hundley.<sup>3</sup> Unequal ureteral dilatation, with greatest distortion usually on the right side, has been found with the occiput on either side of the pelvis and with breech presentations. These findings suggest that weight, contour, and position of the uterus are more significant factors in ureteral dilatation than is any intrauterine attitude of the fetus.

### Postural Influences on the Pelvic Ureter

Comparison has been made between roentgenograms taken of the catheter-containing lower ureters with the foot of the table elevated 15 degrees and with the head of the table elevated 15 degrees. The terminal pelvic portion of the ureters and the presenting fetal part were consistently higher in the pelvis with the foot elevated than they were with the head of the table elevated. This amount of mobility is illustrated in Fig. 1. Movement of the lower uterine segment and adjacent ureters suggests that urinary function may be influenced by variations in position which produce stretch or release tension on the pelvic segment of the ureter.

### Unequal Ureteral Dilatation in Pregnancy

One major unsolved problem in the study of pyelo-ureteritis is why symptomatic dilatation, stasis, and infection occur more frequently on the right than the left side. The theories advanced for greater dilatation of the right ureter have been dextrorotation of the uterus, the splinting influence of the sigmoid on the left, the angle of anatomic crossing of the ureter over the right iliac artery, and compression of the ureter at the pelvic brim on the right side. In Robertson's<sup>18</sup> comprehensive review of 943 articles covering almost two centuries of literature on "Hydronephrosis and Pyelitis of Pregnancy," the theory of ureteral compression at the pelvic brim has a large number of advocates. It is primarily on the basis of the compression theory that postural procedures such as the knee-chest position, lying on the unaffected side, elevation of the foot of the bed, and resting on the face have been recommended as therapeutic measures.<sup>19-22</sup> DeLee<sup>23</sup> doubted that compression caused ureteral dilatation. He advanced the thought of Luchs that the uterus, being about the same specific gravity as the other abdominal viscera, would not cause compression of the

ureter. Baird<sup>24</sup> has expressed the belief that gravity is more important in urinary drainage than is any release of pressure from Trendelenburg position. In line with the gravity theory, Fowler's position has long been advocated by clinicians as an important aid to postural drainage in pyelonephritis of pregnancy.<sup>25, 26</sup> Other authors<sup>15, 27</sup> have questioned the advantage of any postural maneuvers in the treatment of urinary tract infections in pregnancy.

While it is possible that the gravid uterus compresses and partially obstructs the ureter as it crosses the pelvic brim, this seems less likely than other considerations based on anatomic and x-ray findings. The ureter is fixed to the peritoneum and surrounding structures by fine fascial tissues which permit much greater lateral than longitudinal displacement. In its fascial attachments the ureter may be compared to a superficial vein. Longitudinal tension on a

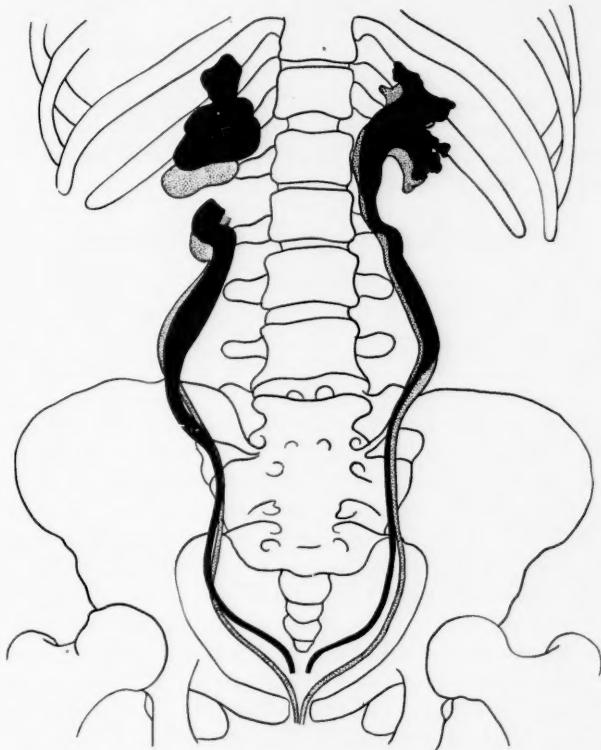


Fig. 1.—Drawing of superimposed pyeloureterograms. Position of the kidney pelves and ureters with the head of the table elevated 15 degrees is shown by the dotted outline. Upward movement of the ureters brought about by 15 degree elevation of the foot of the table is illustrated in black. The pelvic portion of the ureters shows a remarkable amount of mobility.

vein causes partial obliteration, whereas the vein can be carried laterally some distance before any degree of constriction occurs. As the ureters cross the iliac arteries and start their course down into the pelvis, they become surrounded by increasingly dense fascial sheaths. When the ureters reach a level with the ischial spines, they take an inward course to traverse the bases of the broad ligaments posterior to the uterine arteries, surrounded by the plexus of uterine veins (Curtis<sup>28</sup>). This portion of the pelvic ureter becomes increased in the massive parametrial plexus of veins which make up the bulk of the cardinal or transverse cervical ligaments of Mackenrodt. Because of their intimate fixation to the juxtauterine portion of Mackenrodt's ligaments, changes in these important weight-bearing ligaments of the uterus will influence the course and

contour of the ureters. When the ligaments are carried downward, the ureters will be stretched in their longitudinal fascial sheaths and partially obliterated. When the weight of the uterus is shifted upward, the ureters will be carried upward with Mackenrodt's ligaments relieving stretch on the pelvic portion of the ureters. Thus far it has been impossible to demonstrate changes in the caliber of the pelvic ureter, but x-ray studies have shown that changes in position do cause on upward and downward movement of the terminal, intraligamentous parts of the ureters.

Preliminary stereoscopic x-ray studies of the lower ureters with small catheters in place and with the patient in an upright position have shown the right ureter to be more posterior than the left. When the foot of the table is elevated 15 degrees, the ureters tend to assume a similar anterior-posterior plane. One patient whose uterus showed no evidence of rotation or displacement was examined in the sixteenth week of pregnancy. In this instance the ureters remained in approximately the same anterior-posterior plane, but moved upward and downward with changes in position. Prather<sup>29</sup> has pointed out that uterine rotation with posterior displacement of the ovarian and uterine vessels may be a contributing influence to the predominance of changes in the right ureter. Additional investigation is needed to prove the correlation between uterine rotation and right ureteral dilatation.

### Shift in Body Fluids in Pregnancy

By the sixteenth to the eighteenth week, the gravid uterus practically fills the true pelvis. All hollow structures passing through the pelvis are subjected to some pressure by the growing uterus.<sup>30</sup> Whether the pregnant woman stands, sits, or walks, the weight of the uterus causes congestion of the veins of the pelvis and lower extremities. Burwell<sup>31</sup> has clearly demonstrated that venous pressure of the lower extremities rises by the fourth month and increases throughout the remaining course of pregnancy. Veal and Hussey<sup>32</sup> have shown that pregnancy produces localized obstruction to the deep veins which impairs function of venous circulation in the lower extremities. Stagnation of blood in the lower extremities increases capillary pressure with a resultant loss of fluids from the circulation into the tissues. Theobald and Verney<sup>33</sup> found the only exception to this rule to be the patient with a pendulous abdomen in which the uterus does not fill the pelvis, but hangs forward suspended by the abdominal wall. When the pregnant patient assumes a recumbent position, fluids lost into the tissues by day return to the circulation to be excreted by the kidneys during the night. This contributes to nocturia, a rather common symptom in the last half of the prepartum period.

From serial pyeloureterograms, the majority of patients with dilated ureters showed more rapid dilution and elimination of the contrast media with 15 degree elevation of the foot of the table than with 15 or more degree elevation of the head of the cystoscopic table (Fig. 2). The immediate improvement in urinary elimination resulting from elevation of the foot of the table would seem to be due to release of ureteral tension by upward displacement of the uterus. If there is an associated edema of the lower extremities, release of pressure on the ilio-femoral veins will increase the urinary volume output.

From these findings, it follows that physiologic urinary stasis may be prevented by a liberal fluid intake and periods of bed rest, preferably with elevation of the hips and lower extremities, during the day as well as at night. Without stasis urinary tract infections are much less likely to occur in pregnancy.

### Summary and Conclusions

The placental and growth-producing pituitary hormones cause bilateral hypertrophy of the urinary tract in proportion to the normal amount of muscu-

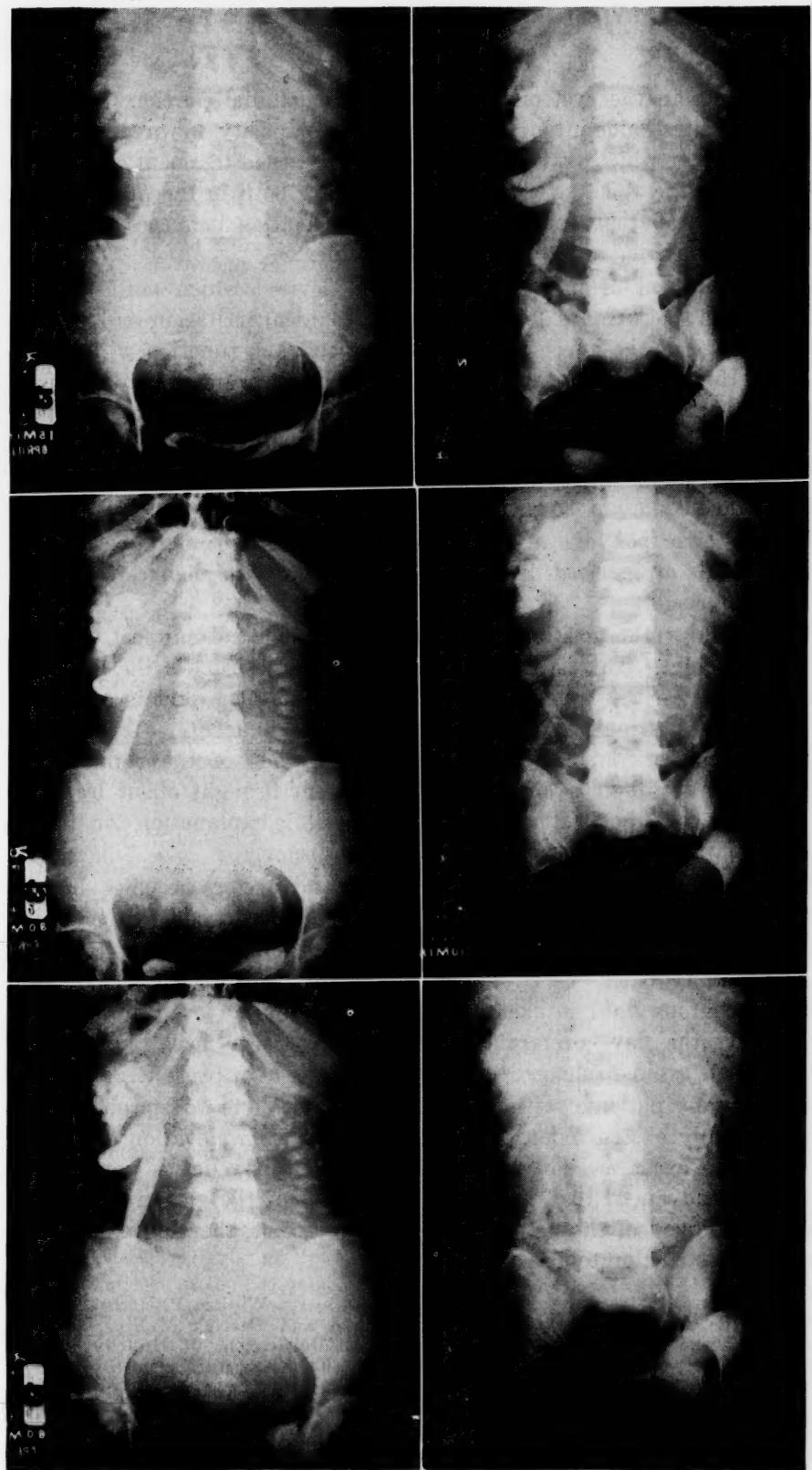


Fig. 2.—Serial pyeloureterograms showing more rapid dilution and elimination of skiodan from the impaired upper urinary tract with the patient in 15 degree Trendelenburg position as compared with 15 degree elevation of the head of the table. The presenting part is highest in the Trendelenburg position.

lofascial tissues in the system. The thinner abdominal portion of the ureter shows the greatest amount of dilatation and tortuosity in pregnancy. That part of the ureter which traverses the base of the broad ligament and enters the bladder wall is the thickest segment of the ureter both in the pregnant and in the nonpregnant patient. Periureteral fascial fixation increases as the ureter crosses the pelvic brim and approaches the bladder.

Until a method of investigation can be devised which permits complete visualization of the urinary tract without mechanical irritation or instrumentation, knowledge of the effect of pregnancy on urinary function will remain incomplete. However, interpretation of the pyelouterograms taken in this study seems to indicate that posture influences the urinary tract in pregnancy in the following manner:

1. There is no remarkable change in the position of the kidneys or in the contour of the abdominal ureters with changes in posture.

2. The pelvic portions of the ureters which pass through the base of the broad ligaments are carried upward and downward with changes in position of the gravid uterus.

3. In an upright position and with good abdominal support, many uteri rotate to the right. This occurs irrespective of the position of the fetus. When the uterus rotates, the transligamentous portion of the ureter is carried along with the large uterine vessels and Mackenrodt's ligaments. Whether or not greater stretch, torsion, and reduction in the lumen of the right ureter result from the dorsal and downward displacement brought about by dextrorotation has not been demonstrated. This is a possible explanation for the greater degree of dilatation usually present in the right ureter.

4. Contrast medium in the kidney pelvis and ureters becomes diluted and is eliminated more rapidly when the weight of the uterus is displaced upward by 15 degree elevation of the foot of the bed than it does with the patient in an upright position.

5. A generous fluid intake plus rest in bed for 20 to 45 minutes once or twice during the day, preferably with the hips at a level higher than the shoulders, will avoid prolonged urinary stasis and help prevent infection.

6. Pregnant patients with costovertebral pain due to spasm and dilatation of partially obstructed ureters receive relief from elevation of the foot of the bed. The exact mechanism which produces this relief is not known, but the theory is advanced that upward displacement of the gravid uterus releases tension and torsion of the pelvic portion of the ureter, thereby removing spasm and partial obstruction to urinary flow.

The authors wish to express their sincere thanks to Dr. William P. Herbst, Head of the Department of Urology; to Drs. Gordon McDonald and Patrick Mullins, Residents in Urology; to Leslie Majors, X-ray Technician in the Department of Urology; and to the Obstetric Staff at Gallinger Hospital for their excellent cooperation in this study.

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### Discussion

DR. FREDERICK H. FALLS, Chicago, Ill.—This is a fundamental piece of work which helps us to understand some of the anatomy of the ureter during pregnancy. This is particularly valuable because this anatomic knowledge is not available in works on anatomy. The average anatomist knows nothing about it because he does not see any anatomic material with the pregnant uterus in place.

When pregnancy occurs there is a physiologic inhibition of the activity of all smooth muscle which is under normal circumstances particularly noticeable in the genito-urinary tract. This is probably accounted for by the action of the corpus luteum hormone in the early months and similar acting placental hormone in the later months. Physiologically, this is necessary so far as the uterus is concerned to avoid abortion. It would seem that the quieting effect on the ureters, as shown by the decrease in the number of urethral peristalses per minute as observed by many writers prior to 1920, is a side-effect which may also be associated with dilatation of the upper portion of the ureter. The cause of the hypertrophy of the sheath of Waldeyer in the lower part of the ureter, as mentioned by Dr. Parks, probably is due to the stimulus to the muscle fibers of this structure by the same growth hormone that produces the hypertrophy of the uterine muscle fibers.

Raising the foot of the bed and turning the patient on the well side in cases of pyelitis has been practiced in our clinic for twenty-five years. There is no reasonable doubt about its favorable influence clinically.

Pyelitis of pregnancy so frequently mentioned in the literature is a misnomer. Dr. Parks was careful to use the term pyelonephritis which indicates correctly that the inflammatory reaction affects the parenchyma of the kidney. And the relief of tension in the ureter acts as would the opening of an abscess as far as preventing further absorption from the kidney tubules is concerned as far up as the cortex of the kidney.

I should like to ask Dr. Parks when this dilatation begins during pregnancy? Also, what is the explanation of the development of the condition of pyelonephritis in the puerperium?

as occurred in seventeen cases after the pressure of the pregnant uterus had been relieved, and the placental and ovarian hormones could no longer have been a factor in producing stasis?

The reason for the prevalence of pyelonephritis in girl babies has been ascribed to the presence of fecal material held against the short female urethra by the diaper. The colon bacillus group are by far the most common organisms found in such cases and one theory at least of pyelitis of pregnancy is that childhood infections never really completely clear up, a few organisms continuing to live in the urinary tract which when conditions of stasis occur during pregnancy light up the infection. It is my opinion from physical examination of patients in the puerperium that during this time postural changes would show mobility of the kidney which during the later months of pregnancy are not demonstrable.

I am wondering if Dr. Parks has made any observations as to the effect of the uterus arcuatus as opposed to the normal uterus in producing pressure phenomena on the ureter. These uteri are frequently unusually wide and deviate from the midline.

It would seem also that some other factor must be present as well as pressure from the uterus when we consider how infrequently one encounters pyelitis in large ovarian cysts and uterine fibroids, especially when either are of the intraligamentous variety.

I should like to call attention to a minor point in anatomy mentioned by Dr. Parks when he refers to the position of the ureter in relation to the uterine veins. It is my conception that the veins surround the artery and that the ureter is posterior to both. The exact course and position of these structures in the full-term pregnant woman are not known and are difficult to determine as indicated by the essayist. It is useless to look for this information where it ought to be found, in books on anatomy.

DR. ROBERT D. MUSSEY, Rochester, Minn.—It is refreshing to read a fundamental piece of work carried out in such a logical way. Clinical observation develops curiosity in the mind of the author, followed by a clinical method of investigation which in this instance entails the use of the ureterogram to test out his idea in regard to why the elevation of the foot of the bed has caused this relief; then the hypothesis that the reason this relief is obtained is because of the anatomy of the ureter in the pelvis and the pressure that is exerted by the pregnant uterus.

We are all familiar with the fact that the ureters in the majority of pregnant women are dilated. This has been demonstrated by a number of investigators. Also, it has been shown that the ureters remain dilated for a number of months after the birth of the child. It would be of interest, and perhaps Dr. Parks will follow this up, to have a series of ureterograms, much as Dr. Falls suggested, on some of the patients whom we are getting up so much earlier after confinement than we used to. There are those who feel it has been a mistake to get patients out of bed on the second or third day after confinement, and that we will rue this later on at the time of menopause or when operation becomes necessary to correct repairs caused perhaps by getting the patient out of bed too soon. It may be that a study of the ureters at this time would be of interest.

Up to the time of chemotherapy it was necessary to rely on certain measures such as rest in bed, forcing fluids, sedatives, and occasionally the employment of ureteral catheterization. I must confess that I have not been greatly impressed over a period of time by the posture of the patient in particular. We have relied chiefly on forcing fluids by the use of glucose intravenously, but I have become a convert and am perfectly willing to admit that the argument in regard to the elevation of the foot of the bed in these cases is a very good one. I would like to have further proof in regard to the reason why the right ureter is more dilated than the left.

DR. EDWARD L. CORNELL, Chicago, Ill.—When skiodan was first presented I had the opportunity at the Cook County Hospital of making a study of the ureter in pregnancy. It was interesting to observe practically the same findings that Dr. Parks has given us. It was also interesting to note that we found the ureter deformity in large fibroids of the uterus without pregnancy. In other words, it seemed to me that any tumefaction, whether it was pregnancy or fibroid or cyst of the ovary, gave the same findings.

It was also interesting at that time that we found the right ureter was markedly dilated over the left ureter in the vast majority of cases. It was seldom that the left ureter was dilated more than the right. I have a great deal of difficulty in convincing the urologist that stricture of the ureter is an important factor in many of these cases. I have difficulty with some of the obstetricians in convincing them that stricture of the ureter plays a part. Some of the urologists feel that stricture does play its part in dilatation of the ureter above the pelvic brim. I think Dr. Parks should bear that in mind when he continues his studies. The passage of a number five catheter does not always tell the true story. It is necessary to pass a number nine or larger dilator.

DR. PARKS (Closing).—We have not investigated urinary changes in the puerperium; 96 of the 113 patients reported in this study had pyelonephritis in the antepartum period.

Thus far we have not encountered a patient with pyelonephritis in association with an abnormal uterus or with levorotation of the uterus. It will be interesting to see if this theory holds in conditions which cause greater stretching and distortion of the left ureter. Anatomic fixation of the ureter is greatest in the terminal portion which is partially encircled by the large uterine veins.

Regarding the physical influence of large pelvic tumors, the ureter can stand a great deal of lateral displacement, but not a lot of longitudinal stretching. Theoretically, tumors which only displace the ureter laterally should not cause a great deal of urinary tract trouble.

## HYSTERECTOMY\*

### A Study Based on 266 Personal Operations Performed in 1945 and 1946

LOUIS E. PHANEUF, M.D., Sc.D., F.A.C.S., BOSTON, MASS.

(From the Carney Hospital)

THE literature of the last decade shows that an increasing number of gynecologists have adopted the total hysterectomy, or panhysterectomy, as the routine operation, and have reserved the supravaginal amputation of the uterus for special cases. This is a total reversal of the opinions held by gynecologists a quarter of a century ago. In 1932, at the forty-fifth annual meeting of this Association, I<sup>1</sup> presented a paper on hysterectomy, analyzing 554 hysterectomies performed on the Obstetrical and Gynecological Service of the Carney Hospital during a period of fifteen years; 300 of these operations having been performed by myself, and 254 by twelve other operators. This analysis showed that 40.0 per cent of these hysterectomies were total. In order to determine what changes have taken place in my practice since the presentation of that paper in 1932, I have analyzed these hysterectomies for the years 1945 and 1946, which form the basis of this paper.

In 1945 one hundred thirty-five operations were performed, and in 1946 one hundred thirty-one, a total of two hundred sixty-six hysterectomies during the two years. These were divided between abdominal and vaginal hysterectomies, 213 being abdominal and 53 vaginal procedures. In the group of 213 abdominal hysterectomies, 88.7 per cent were total; the remainder, or 11.3 per cent, were divided among cesarean hysterectomies, fundic hysterectomies, and supravaginal hysterectomies. In the group of 53 vaginal hysterectomies, 86.7 per cent were complete; the remainder, or 13.3 per cent, were divided between the composite operation (fundic hysterectomy, amputation of the cervix, and interposition of the middle portion of the uterus), 9.4 per cent, and vaginal supracervical hysterectomy, 3.9 per cent.

According to the above figures, I am now doing more than twice the number of panhysterectomies that I was doing fifteen years ago. At the present time the total operation is done routinely, and the subtotal operation is reserved for special reasons or indications. Under present-day conditions the mortality of panhysterectomy, in experienced hands, should not be greater than that of the less formidable procedure. The convalescence has been simplified by proper preoperative care so that the patient reaches the operating table in improved or satisfactory condition, and the postoperative care has been greatly improved through the intravenous administration of blood, blood plasma, amino acids, glucose, and physiologic saline solution. The sulfonamides and the antibiotics have played an important role in combatting infection, and the great improvement in anesthesia during the last two decades, early ambulation, and the present-day management of thrombophlebitis and phlebothrombosis should receive their full share of credit in this general improvement.

The technique of operation has not changed remarkably during the past fifteen years—one noteworthy point, however, has been the tendency toward

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closing the vagina and the abdomen without drainage. In the early days of the sulfonamides, sulfanilamide or sulfathiazole was left in the pelvis before the abdomen was closed, but, in a comparable series, with and without these remedial agents, it has been proved to my satisfaction that there is but little or no difference in the postoperative period. The improved results should be ascribed to better surgery in general, to the employment of finer sutures, and to better pre- and postoperative care, rather than to the use of the sulfonamides. Again, experience has shown that these substances exert their most satisfactory effect when given orally or parenterally.

In this group of 266 patients the ages were as follows: between 20 and 29 years, ten patients; between 30 and 39 years, sixty-three patients; between 40 and 49 years, one hundred twenty-five patients; between 50 and 59 years, forty-six patients; between 60 and 69 years, seventeen patients, and between 70 and 79 years, five patients.

Before their last admission to the hospital 158 previous operations had been performed on these patients—in other words, 59.7 per cent had been operated upon previously. In eighty-six the operations were of a gynecologic nature and consisted of the following: fundic hysterectomy, abdominal hysterotomy, myomectomy, cesarean section, ventral suspension of the uterus, round ligament suspension of the uterus, pelvic sympathectomy, salpingo-oophorectomy, oophorectomy, salpingectomy, amputation of the cervix, trachelorrhaphy, cauterization of the cervix, dilatation and curettage, biopsy of the cervix, radium implantation, colpoperineorrhaphy, Kennedy operation for incontinence of urine, vaginal plastic operations, hysterosalpingectomy, anterior colporrhaphy, resection of ovaries, and abdominal fixation of the uterus, with or without a previous plastic operation. In seventy-two the operations were of a non-gynecologic nature and consisted of: appendectomy, appendectomy during pregnancy, cholecystectomy, nephrectomy, operation for diverticulitis, inguinal herniorrhaphy, and thyroideectomy.

TABLE I. PRINCIPAL DIAGNOSES

<i>Uterine pathology:</i>	Cervix:	Malignant	4
		Benign	11
	Corpus:	Malignant	6
		Benign	189
<i>Ovarian pathology:</i>		Malignant	2
		Benign	30
<i>Tubal pathology:</i>		Malignant	0
		Benign	16
<i>Miscellaneous:</i>			4

Four cesarean hysterectomies were performed; three for multiple myomas and one for hemorrhage associated with central placenta previa.

In addition to these 266 principal diagnoses, 392 supplementary diagnoses of a gynecologic, and 159 supplementary diagnoses of a nongynecologic nature were made. Space does not permit the separate listing of these supplementary diagnoses.

The indications for the seven Wertheim operations were as follows: Carcinoma of the cervix, three; carcinoma of cervical polyp and corpus carcinoma, one; endometrial sarcoma, one; pelvic endometriosis, severe, one; and multiple myomas with severe endometriosis of rectovaginal septum and right ovary, one.

In connection with the 266 principal operations listed above, 411 concomitant operations were performed, 260 being of a gynecologic nature, and 151 of a nongynecologic nature. The adnexa were removed completely in 139 patients, and partially in 34 patients, a total of 173 patients.

TABLE II. TYPES OF HYSTERECTOMIES PERFORMED

<i>Abdominal:</i>	Panhysterectomy	182	
	Wertheim	7	
	Supravaginal	18	
	Fundie	2	
	Cesarean hysterectomy	4	213
<i>Vaginal:</i>	Panhysterectomy	46	
	Supracervical, with interposition of cervical stump	2	
	Composite operation (fundie hysterectomy, amputation of cervix, and interposition of middle portion of uterus)	5	53
	Total		266

General anesthesia was administered in 65 per cent of the patients, and spinal anesthesia in the remaining 35 per cent.

Drainage was instituted in thirty-two abdominal hysterectomies as follows: Wertheim operation, six patients; abdominal panhysterectomy, nineteen patients; supravaginal hysterectomy, three patients; cesarean hysterectomy, four patients, and vaginal hysterectomy, forty-five patients.

Sulfanilamide powder was left in the pelvis in 104 cases of abdominal hysterectomy and omitted in the remaining 109 cases.

Transfusions were given pre-, intra-, and postoperatively to 103 patients in this group; fifty were transfused with whole blood, and fifty-three with blood plasma. The largest amount given to any single person in the group was 2,000 c.c. which was given to a patient who had had an abdominal panhysterectomy, and the largest amount of blood plasma that was given was 2,000 c.c. to one who had had a supravaginal hysterectomy.

In addition to the abdominal hysterectomy, vaginal plastic operations were performed in sixty, or 22 per cent of the patients.

The postoperative complications were included in the group of 551 supplementary diagnoses, 392 of which were of a gynecologic nature, and 159 of a non-gynecologic nature. Space does not permit listing these in detail. It should be stated, however, that all complications were overcome under accepted and adequate management.

### Mortality

Three women died in this group of 266, a gross mortality of 1.1 per cent. All three deaths occurred in 1945; there were no deaths in the 131 hysterectomies performed in 1946. The details of these deaths follow:

CASE 1.—Mrs. S. L., 47 years of age, was operated on because of a large myoma uteri, a scarred cervix, a first degree rectocele, and a relaxed perineum. The operation was performed on April 25, 1945, and consisted of a panhysterectomy, a bilateral salpingo-oophorectomy, and an incidental appendectomy. The patient had a perfectly normal postoperative course, and was discharged from the hospital on the fourteenth postoperative day. Examination that morning revealed an entirely satisfactory operative result, and there was no evidence of pathology of the venous system. On arriving home she experienced an attack of collapse, dyspnea, cyanosis, and rapid pulse. Her family doctor administered oxygen and sent her back to the hospital with a diagnosis of "Massive Pulmonary Embolism." She was pronounced dead at 12:20 P.M., about five minutes after readmission to the hospital. Her husband refused autopsy.

CASE 2.—Mrs. H. P., 45 years of age, had lysis of adhesions, a supravaginal hysterectomy, bilateral salpingo-oophorectomy, and an appendectomy with pelvic drainage on June 25, 1945, for a gangrenous, submucous myoma of the uterus,

gangrenous adnexa, bilateral tuboovarian abscesses, and periappendicitis. On July 4, 1945, two cigarette drains were removed. After a prolonged febrile course, during which time adequate sulfanilamide and penicillin therapy, together with two blood transfusions were given, the diagnosis of a lung abscess was made by x-ray on July 18, 1945. Following this there was extreme difficulty in breathing, and marked râles over both lungs. The pulse rate was slow and irregular, and the blood pressure was 112/70. Stimulants were given, but she expired at 8:50 P.M. Permission for an autopsy could not be obtained.

CASE 3.—Mrs. C. D., a primigravida, 42 years of age, was delivered by low transverse cervical cesarean section, under local anesthesia, because of a fifty-two hour labor and cephalopelvic disproportion. Three hours after operation the uterus relaxed and there was moderate postpartum hemorrhage. This condition responded to intravenous ergotrate, 500 c.c. of blood plasma, and 500 c.c. of whole blood. Subsequently she developed bronchopneumonia which was treated by the Medical Service. After recovering from the pneumonia she had two postpartum hemorrhages, the first was mild and was controlled by uterovaginal tamponade, the second, which occurred on April 22, 1945, was severe. Uterovaginal tamponade again controlled the hemorrhage and she was given another 500 c.c. of whole blood transfusion. The following day the packing was removed, there was no bleeding, but a large amount of creamy lochia escaped from the uterus. A piece of necrotic placenta, the size of a large grape, was removed from the fundus, the uterus was packed with sulfanilamide gauze, and she was returned to bed in good condition. Thus far 1,250 c.c. of blood plasma and 1,500 c.c. of whole blood had been administered.

On April 28, 1945, supravaginal hysterectomy with bilateral salpingoöophorectomy was performed. Five grams of sulfanilamide powder were placed in the cul-de-sac and the pelvis was drained through the vagina. On May 7, 1945, wound dehiscence occurred, with extrusion of the omentum through the incision. Under spinal anesthesia a portion of the omentum was resected and the incision closed. On May 10, 1945, she passed a large clot by vagina, and on May 12 she passed another large clot. Her condition was fair. Vaginal packing with sulfanilamide gauze controlled the hemorrhage. On May 13, 1945, there was no bleeding by vagina, and the packing was left in place. On May 14, 1945, at 7 A.M., there was slight bleeding, and at 10 A.M. a large clot was passed. During the afternoon an enormous clot was passed; it filled the bottom of a bedpan, and the patient went into shock. Three units of blood plasma were given intravenously, and the vagina was packed, but she did not respond to treatment and expired at 4:45 P.M. Permission for an autopsy could not be obtained.

#### Summary and Conclusions

1. Two hundred sixty-six hysterectomies performed by the author in 1945 and 1946 are reported.
2. In this group there were 213 abdominal hysterectomies, of which 88.7 per cent were total.
3. In fifty-three vaginal hysterectomies included in the series 86.7 per cent were total.
4. There were three deaths in the 266 patients, a gross mortality of 1.1 per cent. One death occurred after a panhysterectomy and two after supravaginal hysterectomies.
5. One hundred three patients, 38.7 per cent, were given transfusions; 53 patients, 51.4 per cent, were given blood plasma; and 50 patients, 48.5 per cent, whole blood.

6. I advocate panhysterectomy as the routine operation when the removal of the uterus becomes necessary, and reserve the subtotal operation for special indications.

7. In experienced hands, with the present-day preoperative and postoperative care, the mortality of panhysterectomy should not be higher than that of supravaginal hysterectomy.

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### Discussion

DR. WILLIAM F. MENGERT, Dallas, Texas.—Dr. Phaneuf has ably presented an account of personal performance, with an over-all death rate of 1.1 per cent. He stressed the changing order regarding hysterectomy and pointed out that he is now doing the total operation routinely. He advocates panhysterectomy and states that in experienced hands, with present-day pre- and postoperative care, the mortality should not be higher than that of supravaginal hysterectomy. These statements deserve careful consideration.

Four years ago I reported before this Association the University of Iowa experience with 1,920 total abdominal hysterectomies. These were done by some fifteen or twenty operators, of which I was one, and there was but one death among the last 343 total hysterectomies in the series. More than half of these operations were performed by residents in training.

Since then I instituted routine total hysterectomy at Parkland Hospital in Dallas. Residents working alone or under direction have performed a total of 326 hysterectomies on the Obstetric and Gynecologic services, with but four deaths, 1.2 per cent. These deaths included hemorrhage from a ruptured pregnant uterus, a purely anesthetic death, uremia from lower nephron nephrosis following mismatched blood transfusion, and a postoperative peritonitis. There were 275 total abdominal hysterectomies, including five obstetric patients, with three deaths, 1.1 per cent. There were 270 elective panhysterectomies performed on the Gynecologic division with but two deaths, or 0.7 per cent. There was one cut ureter in this series.

We close the abdomen without drainage. I do not think any of those patients were drained abdominally. The wound bed is extraperitonealized and drained vaginally for twelve to eighteen hours, routinely.

Total hysterectomy is necessary in the presence of endometrial, ovarian, or tubal malignancy. It is necessary for pelvic inflammatory disease and is desirable for myoma. Men like Dr. Phaneuf have brought forth a change in the old order. The advocate of total hysterectomy no longer needs to defend his position. On the contrary, there is rarely indication for incomplete operation when removal of the uterus is necessary. I think we should stress this point, because too many subtotal operations are performed too often by too many operators for no other reason than that the woman has a uterus. Hysterectomy for recognizable disease is for the experienced operator alone, and should be of the total variety.

DR. EDMUNDO G. MURRAY, Buenos Aires.—On the subject of total or subtotal hysterectomy I am of the same opinion as Dr. Phaneuf. The reasons are fourteen cases of cervical carcinoma I have recorded that appeared after subtotal hysterectomy. I have also observed pelvic postoperative infections, probably due to cervical inflammations. When the cervix is not removed with the uterus I always coagulate it with electrosurgery immediately after the subtotal hysterectomy.

The Argentine gynecologic clinics are enthusiasts on conservative surgery. I have done myself during the last ten years more conservative uterine operations than radical surgery. It is meant certainly for benign conditions.

I would like finally to call attention to a conservative surgical technique employed in fibromyoma of the uterus, and devised by Carlos R. Cirio of Buenos Aires. The first steps are those of a normal fundal hysterectomy. Once the fundus is open the procedure consists in removing with electrosurgery the myometrium of the anterior and the posterior wall of the uterus, with the nodules included in it. The internal wall remaining, formed by endometrium and a thin layer of musculature, is brought together at the fundus with interrupted sutures. The external wall is closed over the internal in the same way.

DR. CLYDE L. RANDALL, Buffalo, N. Y.—I would like to mention one item that I think should be recorded by this Association. The late Dr. James E. King did not have a death following hysterectomy after May, 1934. For the past six years at the Buffalo General Hospital we have been employing the total operation routinely, somewhat to Dr. King's displeasure, because he always believed that for benign disease the subtotal operation was to be preferred. During that twelve plus years Dr. King performed over 850 consecutive hysterectomies without a death, leaving us quite a record to attempt to equal with the total operation.

DR. WILLIAM H. WEIR, Cleveland, Ohio.—I have been a proponent of total hysterectomy and have performed it in 100 per cent of my cases in the past thirty years. There is one point to be brought out, and that is the advisability of coincident perineal repair if it be necessary. Lately I have been having one case after another of prolapsing cervix developing after previous supravaginal hysterectomy by some other operator who failed to repair a relaxed vaginal outlet at the same time. Many of these cervices have been markedly diseased and certainly should have been removed at the original operation. When the entire uterus had been removed but the repair had been neglected, the prolapsing structures offered a more difficult problem. The trouble is that many of these hysterectomies were performed by men who had no proper conception of gynecologic problems. They would perform a supravaginal hysterectomy, perhaps for a simple unoffending fibroid, and ignore the existence of a badly damaged cervix and relaxed perineal or vesical supports. It is usually much simpler to remove the cervix at the time of the hysterectomy than to remove it after a supravaginal hysterectomy.

In our clinic we have had a higher mortality with our supravaginal than with our panhysterectomies. This may be explained by the fact that in a very difficult case one is likely to leave the cervix to shorten the operation, and these difficult or badly infected cases naturally show a higher death rate.

DR. PHANEUF (Closing).—In answer to Dr. Mengert's question about drainage, I wish to state that, when indicated, we usually drain hysterectomies vaginally. We drain the pelvis in cases where the peritoneum is insufficient to cover all raw areas, a condition encountered in severe endometriosis and chronic pelvic inflammatory disease. Our custom is to introduce a small iodoform gauze drain through an opening left in the center of the vaginal cuff, the double end of the gauze goes into the vagina, and the free ends are spread over to the sides of the pelvis, the sigmoid is swung over to the right side and, by uniting it to the peritoneum of the right lateral pelvic wall, to the bladder peritoneum and to the peritoneum of the left lateral pelvic wall, the pelvis becomes roofed over by the sigmoid, and the raw areas under the sigmoid are drained through the vagina.

Dr. Mengert has mentioned having seen fourteen cases of carcinoma of the cervical stump, and this led him to the more frequent use of panhysterectomy. The first hysterectomy that I ever did was a panhysterectomy. My former chief, the late Dr. Frederick W. Johnson of Boston, was doing panhysterectomies exclusively in 1913, at a time when no one else was doing this operation for benign disease of the uterus in our section of the country. During the twenty-five years we were associated on the Carney Hospital Service I saw him do but one supravaginal hysterectomy, and that was on a spinster with a fundal myoma and a very long cervix. His reason for advocating panhysterectomy was that he also had seen a number of carcinomas of the cervical stump, which led him to the decision that supravaginal hysterec-

tomy was not a good operation. As a matter of prophylaxis against stump carcinoma, we have an absolute method when we remove the entire uterus while operating for benign uterine disease.

Dr. Murray has mentioned his method of performing hysteromyectomy. I believe this method is a sound one when applied to the younger group of women.

Dr. Randall spoke of the record of Dr. James E. King of Buffalo, who performed 850 hysterectomies without a death. Obviously this is an amazing series and one hard to duplicate.

We know that for many years Dr. Weir has advocated the removal of the entire uterus while performing hysterectomy. The technique of his procedure is well illustrated in our Transactions for 1931. He has also stressed the advantage of perineal repair in connection with panhysterectomy. In the series of cases that we have presented we had done perineal work in 22 per cent. Our method of procedure is to do the panhysterectomy first, and, if at the end of this intervention the patient is in good condition, we do the perineorrhaphy immediately. If, on the other hand, it is observed that the hysterectomy is a sufficient operation for that day, we return the patient to bed and repair the pelvic floor, under local anesthesia, three to six months later, as a second-stage operation.

## **DIVERTICULITIS: SYMPTOMS, COMPLICATIONS, AND MANAGEMENT, PARTICULARLY IN THE FEMALE\***

VIRGIL S. COUNSELLER, M.D., ROCHESTER, MINN.

(From the Division of Surgery, Mayo Clinic)

MUCH progress has been made in recent years in the diagnosis and management of diseases of the colon, especially by the roentgenologist, who can now accurately distinguish between inflammatory and malignant lesions. Another great aid has been the introduction of the sulfonamide drugs.

Diverticulitis is an inflammatory disease of diverticula of the colon. It now is easily recognizable, and is much more satisfactorily treated than before, both medieally and surgically, with a very marked reduction in the operative mortality rate.

### **Incidence of Diverticula**

The incidence of diverticula (diverticulosis) of the colon is not accurately known because all affected persons do not undergo roentgenologic examination of the colon, which is the only positive method of identifying the condition, except for direct inspection of the colon during other surgical procedures in the abdomen and at necropsy. Morton reported the incidence of diverticulosis to be 15 per cent in 8,500 necropsies, while Brown of the Mayo Clinic reported that diverticulosis was seen in 8.5 per cent of the patients examined roentgenologically and in 5 per cent of those who came to necropsy. As Brown also said, these figures must be considered in terms of age, for it is known that diverticula of the colon are rarely seen in persons less than 30 years old, that 4 per cent are encountered in persons between the ages of 30 and 40 years, and that approximately 95 per cent occur in persons 40 years of age or older.

### **Origin of Diverticula**

The foregoing figures certainly indicate that these diverticula of the colon are acquired and not congenital. Why some individuals acquire them and others do not is unknown, but it can be reasonably supposed that some congenital defects of the musculature of the wall of the colon may affect, or have a part in, the development of these pouches.

Almost everyone is agreed as to the probable mechanism of production of diverticula; namely, that they result from the action of contractions occurring simultaneously distal and proximal to a normal segment of bowel. Increased tension which is created in a normal segment by this mechanism causes herniation of small portions of the mucosa through the wall of the bowel at areas of least resistance, which are most likely located where blood vessels pierce the wall of the bowel.

\*Read at the Fifty-Eighth Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Hot Springs, Va., Sept. 4 to 6, 1947.

### Production of Diverticulitis

Inflammation of these mucosal hernias, then, is designated as "diverticulitis." We know that diverticulitis will not develop in all people who have diverticulosis, but we do not know what proportion of patients with diverticulosis will have diverticulitis. However, Abell has estimated that 10 to 20 per cent, and Brown and Mareley that 12 to 16 per cent of patients with diverticulosis ultimately will have diverticulitis.

### Type of Treatment

The next bit of information we should have is what per cent of those with diverticulitis can we reasonably expect to require only medical treatment and what per cent will require surgical treatment. In a recent surgical study of this disease, Pemberton, Black, and Maino reported that of 600 patients who had diverticulitis, 144, or 24 per cent, were treated surgically, so that from their experience they feel it could be said that in about one of every four patients with diverticulitis complications requiring surgical treatment will develop.

### Distribution of Lesions

The distribution of diverticula of the colon is of considerable importance. About 80 per cent of the lesions are located in the sigmoid, and the remaining per cent are distributed in a decreasing proportion toward the cecum. Weber said that he practically never sees diverticulitis situated above the crest of the ileum in a roentgenogram of the colon. The sigmoid colon is in close proximity or adjacent to the female pelvic organs, so that diverticulitis of this segment of the bowel can and does extend to these other structures. Diverticulitis can involve the adnexa on either one side or both sides and occasionally the urinary bladder, but the latter has some protection from the sigmoid when the uterus is in its normal anterior position. The importance of the differential diagnosis of inherent lesions of the sigmoid and the female pelvic structures is immediately apparent.

### Diagnosis

The symptoms are those related to some inflammatory process within the abdomen, and usually in the pelvis or low in the left lower abdominal quadrant. These are pain, increase in temperature, and leucocytosis. If the process is a recurring one, or one of several weeks' duration, there may be signs of obstruction, perforation, formation of abscess, and fistula, either enteric, vesical, or cutaneous. The symptoms depend on the severity of the inflammatory process and its progression. That is, the process may be confined to the diverticulum only, but in some instances a small abscess will form which perforates and extends along the wall of the bowel, producing a thickened, narrowed tubelike structure with partial or complete obstruction of the colon. If the abscess extends to the adnexa, the signs become those of a tubo-ovarian abscess or abscess of the cul-de-sac of Douglas.

Sigmoidoscopy frequently is of very distinct aid in establishment of the correct diagnosis, or at least, in giving such evidence as to cause the physician

to be strongly suspicious that diverticulitis was the basis of the difficulty. For example, Jackman and Buie reported five signs that indicate diverticulitis: (1) limited mobility of a segment of the bowel that normally is freely movable, (2) angulation of the upper part of the rectum because of inflammation, (3) reduced lumen and adherent mucosal folds, (4) sacculation of the sigmoid, and (5) actual visualization of the diverticula.

The roentgenologist is most helpful in determining the diagnosis by means of the barium enema. If the lumen of the colon is completely obstructed, then all the roentgenologist can state is that there is obstruction which may be inflammatory or malignant, but if the barium will pass through and above the lesion, a picture results which can be interpreted as characteristic of an inflammatory or malignant condition. In the former instance the mucosa is uninvolved; it presents a feathery appearance, and the lesion extends along the bowel, whereas in the latter case the mucosal pattern ceases abruptly and extends around the bowel, instead of along the long axis of the bowel. When a perforation has occurred and a perisigmoidal abscess supervenes, the barium may pass through the opening and outline the abscess. A sigmoidovesical fistula rarely can be demonstrated by a barium enema, but gas and feces which are expelled from the urethra after the development of some inflammatory process in the left side of the pelvis usually are attributed to diverticulitis.

When a female patient has a mass in the left adnexal region which may seem, on bimanual examination, to be situated a little higher than usual, a roentgenogram of the colon not infrequently is most helpful in differential diagnosis. A carcinoma of the colon without many symptoms referable to the bowel or tenderness may be mistaken for a solid tumor of the ovary. Such a situation I have experienced on a few occasions. The roentgenologist usually, as previously stated, can establish the diagnosis, but at surgical exploration it is quite impossible in some instances to determine grossly if the lesion is inflammatory or malignant. The two lesions have many features in common. A pelvic mass which has been diagnosed as "pelvic inflammatory disease" or "pelvic tumor" can very well be regarded with the suspicion that it is primarily diverticulitis. The following case is representative.

CASE 1.—A woman 53 years old came to the Mayo Clinic on Jan. 10, 1946, complaining of constipation. She said she had been perfectly well until Dec. 1, 1945, when she had become constipated. Constipation gradually had become worse during the next three weeks. Then she had begun to have some degree of fever. She had been hospitalized at home for awhile and had improved, but after being discharged she had become worse, so that it was necessary for her to re-enter the hospital. At this time a tumor mass had been found in the pelvis, and for this she had been referred to the clinic.

On examination she was seen to be rather obese and not acutely ill. The leucocyte count was 12,100, and the erythrocyte count, 4,960,000 cells per cubic millimeter of blood. The value for hemoglobin was 12.3 Gm. per 100 c.c. of blood. The sedimentation rate (Westergren) was 45 mm. in one hour. The blood pressure was 124/84, expressed in millimeters of mercury. The temperature was 99° F. (37.2° C.). On pelvic examination, a mass was found which was diagnosed as a large pelvic tumor, probably uterine, with some compression of the rectum. Pelvic exploration was advised and performed on Jan. 16, 1946, by Dr. Waugh.

A primary lower midline incision was made. The patient was found to have very active subacute perforating diverticulitis involving the lower two-thirds of the sigmoid. The adnexa were normal. The uterus contained only very small fibroids, which were of no consequence. Gallstones were noted. Extraperitoneal resection of the lower two-thirds of the sigmoid was performed, with removal of all of the involved bowel, and use of a three-bladed clamp. A colonic stoma was created, which was closed at a later date.

Acute pelvic inflammatory disease and acute diverticulitis easily may be confused clinically, and a serious diagnostic error may be made. When this possibility presents itself, a roentgenogram of the colon can be most useful. The following case is an excellent example.

**CASE 2.**—A woman 43 years old was admitted to St. Marys Hospital on the gynecologic service because of acute lower abdominal crampy pains which had lasted for ten hours. Pain was situated mostly in the left lower abdominal quadrant, and was increasing in intensity. The pain was nonextending, but it doubled the patient up and caused her to perspire. It became worse when she moved about. The pain gradually increased and then subsided. Nausea was moderate. There was no change in bowel habits. Menstrual periods were normal.

On examination the patient did not appear to be acutely ill. Intestinal peristalsis was normal, but there was acute tenderness over the entire left lower abdominal quadrant; this tenderness overlapped the midline. Rebound tenderness was noted. The blood pressure was 130/80. The pulse rate was 108 per minute. Emergency leucocyte count disclosed 13,000 cells per cubic millimeter of blood. The urine was normal. On vaginal examination a copious, creamy-white discharge was noted. There was considerable tenderness when the cervix and uterus were moved. A roentgenogram of the colon revealed diverticulitis which involved the sigmoid, with mild deformity and no obstruction. In about twenty-four hours an ill-defined mass could be distinguished in the left lower abdominal quadrant. With the patient under medical management the process subsided, and she was dismissed five days later.

### Medical Management

This case also serves to remind us that under appropriate management, such instances of diverticulitis will subside in 75 per cent of cases, but may recur. Briefly, the nonsurgical management consists of absolute rest in bed until the infection has subsided. This period will vary from two to three weeks. The external application of heat has been found to be very beneficial; the best method of application is diathermy. The daily oral administration of 6 to 8 Gm. of sulfasuxidine, 15 minims (0.92 c.c.) of tincture of belladonna three times a day after meals, and a half-ounce (14.8 c.c.) of mineral oil twice a day, is about all the medication which is needed, except for mild sedative agents. A bland diet is always recommended.

### Complications and the Management Thereof

The complications of diverticulitis are as stated, notably perforation, obstruction, and formation of fistulas, and it is patients who have this group of symptoms who require surgical treatment. It has been observed that those patients in whom these complications usually develop have a more severe and in-

tense illness from the onset, and they appear to be more sick than the patients who will not require surgical treatment. The process does not subside under appropriate treatment, but when it does show some regression, the inflammation seems to continue, as a result, usually, of perforation into the bladder, adjacent loop of small bowel or through the abdominal wall, or of the formation of tubo-ovarian abscess.

A sigmoidovesical fistula is one complication, however, which can develop rather insidiously as well as rapidly. The symptoms are primarily vesical, with a considerable degree of dysuria, pyuria, and the passage of particles of feces and of gas through the urethra. Such fistulas never heal spontaneously, as do some cutaneous fistulas from the sigmoid. The following case is a good example of sigmoidovesical fistula.

CASE 3.—A woman 58 years old first came to the clinic in June, 1943, for exophthalmic goiter. She returned in April, 1946, for recurrent exophthalmic goiter. At her last visit she related that she had experienced some lower abdominal discomfort periodically, but that it was not very severe. She mentioned it because symptoms referable to the urinary system had developed. She also said that she passed some gas through the urethra. Cystoscopic examination disclosed only some cystitis. Pyuria of grade 2 to 3 was present. A roentgenogram of the colon revealed diverticulitis, with perforation and a sigmoidovesical fistula. Operation was advised.

At operation by Dr. Pemberton on June 17, 1946, a primary lower left rectus incision was made. The sigmoid was found to be adherent to the bladder on the right side near the dome, just to the right of the midline. The bowel was easily separated from the bladder. The fistulous tract was about 1 cm. in diameter. The opening in the bladder was closed with chromic catgut sutures and the segment of sigmoid which contained the diverticulitis was brought out as an extrafascial exteriorization operation. Eleven days later, on June 28, 1946, cautery excision of the exteriorized loop was performed. The remaining colonic stoma was closed about four months later, on Oct. 18, 1946.

Surgeons who are skilled in surgery of the colon are agreed that the cure of most patients with complicated lesions of diverticulitis resides in a multiple-stage procedure, such as colostomy followed weeks or months later by resection of the involved portion of colon, with end-to-end anastomosis, or by exteriorization of the involved segment of bowel. Closure of the colonic stoma or stomas, as the case may be, subsequently is accomplished when all healing is completed.

As a general rule, when the diagnosis has been made, the preliminary procedure should be colostomy, carried out at some distance proximal to the lesion and preferably in the transverse colon. Usually, the inflammatory reaction subsides rapidly as relief of the obstruction takes place. The question as to whether the colonic stoma later could be closed without subsequent resection has been debated for many years. It is thought that if one year to two years have passed and all clinical, roentgenologic, and proctoscopic evidence of inflammation has disappeared, then the colonic stoma might be closed. The incidence of recurrence after closure of the colonic stoma still seems to be too high, and it would appear that resection should be performed in a few weeks after colostomy. Pemberton, Black, and Maino reported that in thirty-eight

instances of closure of the colonic stoma, there were two deaths postoperatively, and twenty-three of the remaining thirty-six patients experienced recurrence of the diverticulitis. Such a rate of recurrence would seem to indicate that colostomy alone is insufficient treatment for complicated diverticulitis.

The surgical risk in the treatment of these complications of diverticulitis formerly was rather high. However, there has been a marked decrease in the operative mortality risk with the introduction of the sulfonamides and penicillin. Pemberton and his co-workers have shown that in a group of 245 patients treated before sulfonamides were available, the mortality rate for all surgical procedures was 14.7 per cent, whereas in a group of 144 patients treated with sulfonamides the mortality rate decreased to 4.2 per cent. Therefore, it would seem that after colostomy, removal of the involved segment of the colon is definitely indicated, and that the indications for surgical treatment in recurrent diverticulitis might be extended.

### Summary

The incidence of diverticulosis is not definitely known. In 95 per cent of the cases, the disease occurs in persons 40 years of age or older. Among approximately 15 per cent of these, diverticulitis will develop. In this group complications requiring surgical treatment will develop in about one in four patients. These complications are perforation, obstruction and formation of fistula. Colostomy is the safest preliminary surgical procedure, and subsequently should be followed by resection of the involved segment of the sigmoid. The operative mortality rate has been markedly reduced by the use of the sulfonamides.

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### Discussion

DR. W. WAYNE BABCOCK, Philadelphia, Pa.—It is refreshing to hear a paper on diverticulitis that really considers the cure as well as the palliation of this serious affliction. It has been surprising to me that most articles appearing up to this time upon diverticulitis of the colon have been very conservative and have emphasized the medical treatment rather than eradication of the disease.

Eight years ago two papers, one by Dr. Dixon and one by Dr. Brown, from the Mayo Clinic, reported 191 cases. The treatment advised was to watch the patient for ten days or more, and if he became worse to do a colostomy proximal to the lesion and to wait a year to see if the colostomy could then be closed. The results of this plan were discouraging. Of sixty-four patients treated by colostomy, 17 per cent died of the colostomy or a related condition; and 44 per cent of those traced were not well. If an abscess developed they waited until it had localized and then incised and drained. Finally, 45 per cent had a corrective type of operation with a 22 per cent mortality. With this mortality and 29 per cent of the traced patients unrelieved, Brown concluded that surgery was inadequate, and he thought

that someone should devise an effective medical means of treating that disease. At the Massachusetts General Hospital the same temporizing type of treatment was followed and of 140 cases, seventy-seven were treated without operation, of which three died in the Hospital and two later, from undiagnosed cancer. I have seen over sixty cases of cancer of the rectum where treatment was delayed four months or more because the x-ray report was negative. The x-ray is not a dependable means for the diagnosis of cancer when associated with diverticulitis or for cancer without diverticulitis when it is in the rectum. Rectal cancer is in the blind spot for the x-ray. Only twelve of the 140 cases that were studied at the Massachusetts Hospital had the diseased area eradicated. Of fifty-five palliative operations, five patients had unrecognized cancer from which they apparently died.

Hayden concludes that diverticulitis without perforation is always a nonsurgical problem. As there was 50 per cent mortality from his drainage of abscesses, he thinks it better to let them perforate spontaneously. Rankin and Grimes, T. E. Jones, and others likewise considered acute, subacute and chronic diverticulitis to be fundamentally medical problems with complications essentially surgical. It reminds me that doctors had the same attitude as to appendicitis fifty years ago. Then T. S. Morton in Philadelphia reported the first appendectomy performed before an abscess had developed, and John Deaver is said to have commented, "I don't see anything in that operation."

Diverticulitis is so common and so often leads to serious complications that it is desirable to have a routine sigmoid and rectal examination made during every pelvic operation.

The troublesome diverticuli usually do not admit barium and therefore are not shown on the roentgen film; however, one of our patients had a perforation from the pressure of a barium enema on a thin-walled sac. Likewise, the proctoscope is not dependable, as showing the mouths of inflamed diverticuli. It is difficult to recognize the openings even in the open bowel.

Cancer is often overlooked in the diagnosis of diverticulitis, but we have seen several patients in whom the hard, diverticular mass was mistaken at operation for carcinoma.

Finally, I may mention that an occasional patient will have diarrhea instead of the usual constipation, and allude to the whistling urination as diagnostic of a perforation into the bladder.

The mortality will of course fall as early radical resections supplant the delayed palliative procedures.

**DR. DAVID FINDLEY, Omaha, Nebraska.**—I wish I had heard this paper a few months ago. It would have saved me no end of embarrassment, because I had two similar cases of diverticulitis within three weeks' time. Many of us are too prone to forget the other organs that may give rise to annoying if not distressing pelvic symptoms. A common question which is asked in Board examinations is, "What is the diagnosis of pain in the right lower quadrant?" But what about the pain in the left lower quadrant?

My patient, a little over 50 years, complained of pain in the left lower quadrant. Other findings were perfectly normal, the diagnosis of ovarian malignancy was made and laparotomy performed. A ruptured diverticulum was found and resection of the sigmoid performed.

The second case was almost identical. With diverticulitis clearly in mind, proctoscopic and roentgenologic examinations were made but nothing found. Laparotomy was done with the clinical diagnosis of pelvic inflammatory disease or ovarian malignancy. We found an acute ruptured diverticulitis, with a frozen pelvis. Again resection was deemed necessary.

The symptomatology of diverticulitis may easily be confused with carcinoma or other neoplasms of the ovary or pelvic inflammatory disease. It is well for us to bear this condition in mind and not depend too much on radiological findings and proctoscopic examinations.

## FETAL AND NEONATAL MORTALITY: CAUSES AND PREVENTION\*

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APPROXIMATELY 4 per cent of all fetuses and newborn children reaching a size and development compatible with extrauterine existence die before, during, or soon after birth. Representative figures are portrayed in Table I. Of these, almost one-third die in utero and one-fifth perish during the birth process. About one-half are born alive, but succumb within the first few postnatal days or weeks.

TABLE I. REPRESENTATIVE FETAL AND NEONATAL MORTALITY RATES

INSTITUTION, OR PLACE	YEAR	DELIVERIES, NUMBER	RATES, PER CENT
Long Island College Hospital <sup>2</sup>	1940-44	7,580	2.63
New York Hospital	1935-40	25,823	3.52
Sloane Hospital <sup>10</sup>			
Chicago Lying-in Hospital <sup>18</sup>	1931-41	27,321	4.28
Dallas	1942	8,691	3.94*
Texas	1942	—	5.36
United States	1942	—	4.04
Connecticut	1942	—	2.92
New Mexico	1942	—	9.79

\*Dallas: Rate for whites, 3.12; Negroes, 7.35; Mexicans, 8.65.

Although figures, standards, and methods of calculation vary, it would seem reasonable to state that the principal over-all cause of death is anoxia,<sup>2, 10, 12, 18</sup> with immaturity ranking second in importance (Table II). Birth injury and congenital malformation vie for third and fourth place, while infection completes a quintet of chief hazards.

TABLE II. PRINCIPAL CAUSES OF FETAL AND NEONATAL DEATH  
(Relative Per Cent)

	NEW YORK HOSPITAL SLOANE HOSPITAL <sup>10</sup>	CHICAGO LYING-IN HOSPITAL <sup>18</sup>
Anoxia	19.8	28.7
Prematurity	18.5	14.4
Congenital malformation	14.1	11.1
Birth trauma	11.6	13.0
Infection	8.1	4.7

The causes and prevention of fetal and neonatal mortality will be discussed under three main headings according to time relationship to birth.

### Intrauterine Fetal Death

Unfortunately, the basic causes of intrauterine fetal death remain largely unknown. About one-half of the children dying in utero become macerated,

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and ultimate examination is difficult. Nevertheless Potter and Adair<sup>18</sup> found evidences of anoxia in about one-fourth of all fetuses perishing before birth. Beck<sup>2</sup> and Greenhill<sup>12</sup> concur in the belief that interference with the function of tissue respiration is responsible for many intrauterine deaths. Partial placental separation is the most obvious and understandable cause, although it does not begin to explain all fetal oxygen deprivation. There are many other causes of intrauterine fetal oxygen deprivation, including such maternal conditions as pneumonia, cardiac decompensation, anemia, and pituitrin stimulation. In passing, it is worthy of note that the cyanotic and club-nailed congenital cardiac and her fetus are habituated to chronic oxygen lack and seldom harmed by it. Finally, the possibility that high altitude flying may cause oxygen deprivation must be mentioned. There is a dearth of factual information concerning this and, therefore, real need for scientific research.

*Premature Labor.*—Arbitrarily selected series to illustrate the incidence of premature labor are presented in Table III. Strictly speaking, death resulting from immaturity occurs intra partum or in the neonatal period. Nevertheless, the cause relates to pregnancy and not to labor. We are aware of increased incidence of premature labor with certain specific conditions, including toxemia, multiple pregnancy, antepartum hemorrhage, and infection. Less well known is the effect of intercurrent maternal illness of nonspecific nature, and of dietary and economic influences.

TABLE III. INCIDENCE OF PREMATURE TERMINATION OF PREGNANCY

	DELIVERIES, NUMBER	YEARS	INCIDENCE, PER CENT
New York Hospital <sup>9</sup>	31,900	1932-43	2.95*
Philadelphia Lying-In <sup>20</sup>	33,668	1930-44	8.8†
Cincinnati General Hospital <sup>3</sup>	13,526	—	10.9†
Parkland Hospital, Dallas <sup>14</sup>	4,123	1944-46	11.3*

\*1,500-2,499 grams.

†Less than 2,500 grams.

Brown, Lyon, and Anderson<sup>5</sup> found only a small difference between the incidences of prematurity in patients with, and those without, toxemia. On the other hand, the incidence soared from 9 to 20 to 47 per cent when toxemia was classified into three grades of increasing severity. Dana<sup>9</sup> found toxemia to be the principal cause of immaturity, with multiple pregnancy second. Slight uterine bleeding or even spotting without apparent cause is sometimes associated with premature expulsion of uterine content.<sup>6, 9, 10, 12</sup> The association increases in significance as bleeding becomes more severe. More than one-half of all patients with clinically recognizable premature separation of the normally implanted placenta give birth to immature children. On the other hand, placenta previa is not as much of a causative factor of prematurity as the treatment directed at it. Nevertheless, the result is identical. The prematurity rate among women with various chronic diseases is several times as high as among those free of complication.<sup>3, 7, 11</sup> Environmental factors also affect the termination of pregnancy. Thus, Dana<sup>9</sup> found more than three times the incidence of prematurity among ward, as among private patients. Parkland Hospital in Dallas<sup>14</sup> caters almost exclusively to an indigent clientele and has the highest incidence (11.3 per cent) of prematurity of those institutions listed in Table III. Moreover, three-fourths of the Parkland patients are Negro or Mexican, with extremely poor diets judged by any standard. Protein deficiency is universally evident, and pronounced in some of them. It may be that the poor dietary and social environment accounts, at least in part, for the high incidence of prematurity. Tyson<sup>20</sup> believes that dietary deficiency has much to do with

increasing the incidence of immaturity. A group of 750 expectant mothers was given a special diet containing large amounts of proteins, vitamins and minerals with definite limitation of fluids. Not one instance of prematurity occurred, but there were thirty-seven premature births in a control group.

Syphilis used to be a prominent cause of premature birth and stillbirth. The employment of serologic tests for syphilis as part of routine prenatal care, with prompt and efficient treatment when indicated, has materially reduced its prominence.<sup>4</sup>

It would hardly be fair to close this section on Intrauterine Fetal Death without mentioning that autoimmunization by the Rh factor is both relatively and numerically insignificant from the etiologic standpoint.<sup>18</sup>

### Intrapartum Death

The chief causes of death during labor are: anoxia, malformation and birth injury, principally intracranial hemorrhage. Other etiologic factors include: intrapartum infection<sup>16</sup> and improper choice of method of delivery.

There is universal agreement<sup>2, 10, 12, 18</sup> that anoxia, resulting in fetal asphyxia is the principal cause of intrapartum death. Moreover, many asphyxiated infants are born alive, only to die neonatally. This will be discussed later. Asphyxia during labor may result from direct interference with the oxygen supply to the child or through some mechanism producing central depression. One factor may produce the other. Thus, intense and prolonged uterine contractions may not only diminish the fetal oxygen supply directly, but also may compress the fetal head. Moreover drugs administered to the mother may produce maternal narcosis and exert a direct depressive action on the fetus. Of the two main factors, direct interference with the oxygen supply during labor is likely to result in fetal death more often than a central depressive mechanism.

According to Murphy<sup>15</sup> 0.7 per cent of fetuses surviving intrauterine existence will be stillborn or succumb shortly after birth because of malformation. These deaths, of course, are unpreventable.

Many types of injury occur during birth. Nevertheless, that most commonly fatal is intracranial hemorrhage, generally resulting from tentorial tear. Except when intracranial injury results from prematurity, it is largely preventable.

Recently Odell and Plass<sup>16</sup> reported that sixty-nine (39 per cent) of 187 infants of mothers suffering with fever of infectious origin during labor were stillborn or died soon after birth. Maternal intrapartum fever, therefore, is an important cause of fetal death and should be vigorously combated with chemotherapeutic or antibiotic drugs.

Obstetrics is an important branch of Preventive Medicine. Among patients receiving adequate prenatal and delivery care, the obstetric emergency is virtually a thing of the past. Brutal operations and the desperate eleventh-hour fight to save a life (so dear to our lay friends in Hollywood) represent, in most instances, failure to anticipate and plan for eventualities. When such desperate situations arise, the desire to save fetal life must not become so overpowering that an operation hazardous to the mother, and in itself often fatal to the child, is performed. In 1931 Plass<sup>17</sup> cautioned against the "exaggerated idea of the value of an infant's life as compared with the life and health of his mother." Nevertheless, operations in themselves especially hazardous to the child, as well as dangerous to the mother, continue to be performed. In some instances, operations with no other excuse for performance than fetal salvage are done when the infant is *already known to be dead!* This was true in Germany in 1928 when Winter<sup>21</sup> reported that 178 cesarean sections, performed

for reasons which could be classed only as fetal, were begun *after* the operator recognized fetal death. It is true in the United States today, when a patient with prolapsed and pulseless cord is managed by abdominal delivery. The fallaciousness of such obstetric philosophy is also reflected in the growing employment of abdominal delivery. Modern incidences of cesarean section range upward as high as 10 per cent, and many reputable physicians and clinics deliver one in twenty women by the abdominal route. Yet Acken<sup>1</sup> reports that while there has been a striking improvement in the maternal mortality rates of cesarean section, the fetal loss remains unchanged. A representative figure is about 8 per cent. It is within reason to believe that many infant lives will be saved if the physician makes an objective, statistical appraisal of survival chances in advance.

### Neonatal Death

Almost half of the total fetal wastage occurs after birth, although the genesis of most of these deaths occurs during labor. The principal causes of neonatal death include cyanosis and atelectasis, anomalies, birth injury, and infection. Almost three-fourths of the children dying during the neonatal period succumb during the first twenty-four postnatal hours. Thus it is evident the death relates to labor and the obstetrician must accept the responsibility.

Schreiber<sup>19</sup> directed attention in 1938 to the deleterious effects of apnea of the newborn. Cole, Kimball, and Daniels<sup>8</sup> showed that sedatives and anesthetics increase the incidence of asphyxia of the newborn in direct proportion to the amounts given, and the duration, respectively. Beck<sup>2</sup> says, "Most of the methods which have been recommended for the relief of pain during labor may cause the death of the child if they are not given with caution." There is virtual unanimity of recorded opinion concerning this point. It is not too far fetched to affirm that relief of the pain of labor is numerically and relatively the biggest single cause of asphyxia of the newborn. It is impossible to guess how many subsequent deaths result from neonatal asphyxiation, but it may be asserted that they are largely preventable. Subsequent atelectasis remains a great problem. It may be that reduction of alveolar surface tension with substances like amyl acetate, as suggested by Gruenwald<sup>13</sup> may prove beneficial.

Birth injury is largely preventable. Although we cannot always avoid prematurity, the aftercoming head, and an occasional difficult vaginal operation, we can withhold sedative drugs, employ nerve block anesthesias, and avoid the double danger of injury plus anoxia.

### Summary and Conclusions

Approximately four per cent of all fetuses and newborn children reaching a size and development compatible with extrauterine existence die before, during, or soon after birth. The principal over-all cause is anoxia with prematurity ranking second in importance.

Five to 10 per cent of all infants are immature, weighing less than 2,500 Gm. at birth. The principal causes of prematurity include maternal toxemia, multiple pregnancy, antepartum hemorrhage, maternal illness of nonspecific nature, and dietary and economic influences. The principal cause of anoxia during and immediately following labor is the analgesic and anesthetic drugs administered to produce relief of the pain of labor.

Neonatal death accounts for almost half of all fetal wastage and three-fourths of this occurs within the first twenty-four hours.

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### Discussion

DR. WARD F. SEELEY, Detroit, Mich.—The marked reduction in the maternal death rate that has occurred in the United States in the past few years has given the obstetrician time and opportunity to consider the other major obstetric problem—namely, neonatal and fetal mortality, a study of which Dr. Mengert has presented.

Two divisions of the subject naturally present themselves, (1) preventable and (2) nonpreventable deaths. Quite naturally, the chief immediate concern of the obstetrician is with the preventable group as with these he might be quite rightly charged. That unpredictable deaths occur there can be no doubt, and in my experience these have been from one-third to one-half of the gross fetal mortality rate. Deaths occurring among nonviable prematures, with fetal abnormalities incompatible with life and with fetuses dead on admission, in the light of our present knowledge, cannot be charged to the attendant. It is possible that further knowledge may, in the future, make it possible for salvage in these groups.

On account of its wide implication in fetal mortality, I have been particularly interested in fetal anoxia. Much of the work of Schreiber has been done with material which is familiar to me, and offers a field for interesting speculation in the subject of prophylaxis. In general, fetal anoxia is due either to failure of the maternal organism to supply adequate oxygen, or to failure of the fetus to receive and utilize sufficient oxygen. Lack of maternal oxygen may be due to anemic anoxia, commonly the result of low oxygen concentration in anesthetic mixtures; from obstruction to maternal respiratory passages by mucous or gastric contents, or to anemic anoxia which may occur in cases of shock and hemorrhage.

Anoxia due to failure of maternal circulation may occur with low blood pressure, cardiac failure, spinal anesthesia, etc. Failure of fetus to receive or utilize oxygen may be due to prolapsed cord, interference with placental circulation, e.g., abruptio placenta. Failure to utilize oxygen even when present in the circulation in adequate amounts can be due to analgesia and to traumatic brain injury with debilitation of the brain tissues.

Schreiber has shown that lack of oxygen to the fetal brain, for even short periods, results in areas of necrosis which, while often fatal, frequently result in so-called "devastation areas" that mentally handicap the child throughout life.

While the time allotted does not permit detailed discussion of all the causes of fetal death as outlined by Dr. Mengert, it is noted that the second major factor is immaturity. It is doubtful, with our present knowledge, whether any reduction in death rate can be made in premature death rates associated with hydramnios and with multiple pregnancy. With better understanding of etiology, prophylaxis and treatment of the toxemias it may be possible to carry more babies to viability. I have been opposed to attempts to carry the nonviable fetus of a toxemic mother to viability, with a few borderline exceptions. Such attempts are frequently misdirected as the fetus succumbs to the toxemia and the mother is irreparably damaged.

The risk for the fetus of a syphilitic mother, previously so grave, has become so minimized with modern therapy as to be no longer a major risk.

The use of anesthetics and analgesics is among the controllable factors in fetal mortality. Adequate supportive measures for the mother during labor and special attention during the hot summer months should not be neglected. In operative deliveries proper choice of procedure and expert appreciation of it at the proper time are essential to low fetal mortality.

After all has been done that is possible to reduce our fetal mortality, there is an irreducible minimum that will be eventually reached. Our last 7,000 consecutive deliveries showed a net fetal death rate of 1.3 per cent.

**DR. IRVING W. POTTER**, Buffalo, N. Y.—This paper brings to my mind the fact that there is such a thing as a concealed prolapsed cord, and those who do not introduce the hand into the uterus will not know it is there.

**DR. ADAM P. LEIGHTON**, Portland, Maine.—Anoxemia is, of course, the principal accepted etiologic factor in the death of the newly born, when especially referring to the question of resuscitation. The greatest danger is in the first few minutes after the baby is born. Very few nurses and some doctors cannot differentiate between asphyxia pallida and asphyxia livida. My meager schooling at the Rotunda Hospital in Dublin, Ireland, has served me in good stead many times in such an emergency. We did at least learn to resuscitate the newborn, when born in asphyxia. The present-day attempts of nurses in the use of a mucous catheter are pathetic. They don't know the technique, and many of the mucous catheters are no good anyway. If you want a good mucous catheter, buy a Carton catheter, an all metal instrument, with separating bell, such as has been used for years at the Rotunda Hospital, and instruct your nurses and interns to use it. As soon as a baby is born, hold the child up by his legs and slip the curved fenestrated end down over the dorsum of the tongue, through the larynx, and suck the mucus into the bell. It is easily expelled and reinserted if needed. Get the upper air passages free and patent first of all. Then if you want to give a little oxygen with the resuscitator, all right. There is nothing more irritating or bothersome than to be doing a cesarean section, and in the meanwhile to have handed over the baby to a crowd of nurses who huddle together way over in the corner, around the "service station pump," trying to resuscitate the baby. You ask, "Is the baby all right?" The nurse will answer, "Yes, it's coming," and all the time it's going. Give me a Carton mucous catheter and a tub of hot water and I'll take my chances. I would be ashamed to go out and greet the husband after the delivery and tell him that the baby died of "asphyxia," or maybe "pulmonary edema," or "atelectasis," when I knew mighty well that it was the improper attempt at resuscitation in the hands of some amateurs that caused his death.

**DR. G. W. GUSTAFSON**, Indianapolis, Ind.—In handling anoxia, we should use more oxygen during labor, particularly in the cases of cord compression and in the lesser degrees of separations of the placenta. Administration of oxygen to the mother will usually give a much better fetal heart rate in a shorter time, and is the quickest response we have to any therapy. This may be the difference between having a live baby and a dead one. Also, we have found that the administration of oxygen during the anesthetic will add very materially

to the rapidity with which the baby breathes when he is born. An hour's ether anesthesia given while oxygen is administered is very different from that without additional oxygen.

DR. J. BAY JACOBS, Washington, D. C.—Anoxemia has been emphasized as an important cause of fetal death, especially in premature infants. I think often anoxemia occurs in babies that are somewhat premature, possibly not according to recognized standards, but in those that are two or three weeks from term. We see this occasionally, even in the hands of those who try to regulate the dosage of analgesic drugs during labor, so I do not feel that all cases of anoxemia—especially those occurring in babies that are slightly premature—are due to improper use of analgesic drugs. The fact that they are just a little bit before term may be an important factor in causing atelectasis. At this particular time most of these babies survive, but occasionally one is lost.

Another factor in preventing intrauterine death, which I recognize as an important one, is the treatment of syphilis in pregnancy. About fifteen or twenty years ago while directing a home delivery service, I noted that only about 10 per cent of the patients had had prenatal care, and also that each month we had a few macerated fetuses to report. About ten years ago we began to round up all indigent pregnant women and were very successful in educating them to the importance of prenatal care. We instituted proper facilities in our prenatal clinics so that patients would not have to go to a separate clinic for the treatment of venereal disease, as was formerly the custom; as a result of this, we found that the stillbirth rate diminished quite markedly. I might say that in a period of ten years, from 1936 to 1946, which are the last available figures, the stillbirth rate was reduced from 38.2 to 23.9 per thousand livebirths; and deaths under one month were reduced from 40 to 27.9 per thousand livebirths for the corresponding period. I attribute this to the treatment of these indigent patients, most of whom were Negro; and it is in that group that you get most mortality, because they are the ones who are less likely to receive adequate medical care.

In regard to maternal mortality, I wish to emphasize the fact that the women who do not get adequate maternity care will raise the mortality in any State. We have reduced ours from 6.5 per thousand livebirths in 1936 to 1.2 in 1946.

DR. GEORGE W. KOSMAK, New York City.—I regard Dr. Mengert's paper as a very important contribution to the literature on this subject. However, I am rather disappointed in the discussion by others that no special stress was placed on anoxia as a factor in fetal deaths.

I would like to ask Dr. Mengert whether he feels that there has been an increase in the number of cases of fetal anoxia since the wider employment of the sedative drugs, particularly the barbiturates. As an editor, I am very much embarrassed to acknowledge the number of papers that I have published in the JOURNAL dealing with this, that, and the other sedative drug given in labor. According to the authors, they are all perfect. They report one, two, or three hundred cases without any fatal results. I cannot question those statements because these contributors are undoubtedly truthful people. And yet we find, notwithstanding all these favorable reports, that there are a great many cases of anoxia for which no other cause can be found.

It seems to me that something can be done by propaganda, especially through the national obstetric societies, to develop a better state of appreciation among the profession at large and among the public so far as these sedative drugs are concerned.

It is unfortunate that routine administration of barbiturates prevails in many, particularly private, hospitals. On admission patients are given routinely the favorite sedative of their physicians, usually without the latter having seen them. A painless labor has been promised without consideration of the immediate or specific needs. The amnesic effects of the barbiturates are acknowledged—the patient may brag about having had the baby in her sleep. But what about the effect on the baby? This is not always truthfully noted. This is rather a serious matter because anoxia is undoubtedly the underlying cause for a number of disturbances in babies which may not manifest themselves immediately and these babies

are pronounced perfect after their birth, since apparently no effect of the sedative drug is observed, but later they may develop cerebral conditions that are irremovable and last them throughout their lives. So I hope some word may go forth and action taken against the routine administration of these sedative drugs.

DR. ARTHUR H. BILL, Cleveland, Ohio.—Much has been said by the discussants about the bad effects of analgesia and anesthesia in contributing to fetal mortality, but I feel that I must disagree and should point out some of the good effects. I am sure that with the proper use of these procedures patients may be carried through a comfortable labor without increasing fetal mortality. On the contrary, in some instances they may have prevented fetal death. Let me illustrate as regards analgesia during the first stage of labor. In general practice, when pain is not relieved the doctor has in very many instances attempted to deliver the baby when conditions did not warrant this, usually to terminate the patient's suffering. Many stillbirths resulted. When the patient is made comfortable one is content to allow labor to go on to complete dilatation and a successful termination. This advantage certainly offsets some of the criticism.

If, during the course of hard labor, the baby is in distress one should not conclude that the anesthesia is the cause. On the contrary, the baby may benefit by the administration of more anesthetic. For example, if the fetal heart slows down to 80 or 90 beats per minute there is abnormal pressure on the baby, by the excessive contraction, likely pressure on the cord. In such a case deeper anesthesia should be administered sufficient to abolish uterine contraction with the probable result that the fetal heart will return to a normal rate. The anesthetic has removed the abnormal pressure and saved the baby. Again, consider a case in which in the latter part of labor there occurs an abnormal amount of "show," and the fetal heart rate increases say to 180. There is a beginning separation of the placenta which will probably become complete with the death of the baby if contraction continues. The immediate treatment should be the administration of complete anesthesia and delivery. Do not attribute the rapid heart rate to the anesthetic. In both of these illustrative cases the anesthetic will prevent fetal death. There are many others. I am firmly convinced that with the proper conduct of comfortable or painless labor we have not increased fetal mortality.

DR. EDWARD L. CORNELL, Chicago, Ill.—A plea for analgesia is not the primary cause for many of these cases of fetal mortality. I want to say that if you permit a nurse to administer these drugs without supervision, why not give her a medical degree? The physician should do the prescribing. If there is not enough help available it is about time to change that situation so that you can have a medical man look after the administration of drugs and not delegate these things to nurses. Nor should the routine analgesia, or whatever may be used, be delegated to a nurse. That is the medical man's province and should continue to be. There should be a medical man on twenty-four-hour duty to handle the cases of delivery. All of these patients should have good medical care, and it should not be left to the nurse to solve such problems.

DR. MILTON SMITH LEWIS, Nashville, Tenn.—I am probably one of those obstetricians whom Dr. Kosmak referred to as "the user of relatively large doses of barbiturates for relief of pain during labor."

We will report our results in 3,000 cases at the Southern Medical Association meeting in Baltimore. That this method of analgesia and anesthesia has actually been accompanied by a low stillbirth and neonatal mortality in our hands is unquestionable. Difficulty in the management of occipitoposterior positions, the incidence of midforceps and cerebral hemorrhage and other birth injuries have been markedly reduced on our service.

We believe adequate sedation permits a more conservative policy in the conduct of labor, because it not only guarantees sufficient rest for the patient but it eliminates pressure from the patient and her relatives for early interference and termination of labor.

DR. MENGERT (Closing).—It is impossible to attempt to cover all of the points raised by the various discussors. Dr. Leighton may be pleased to know that we have no

resuscitating machine. We have an old-fashioned idea that students will not have access to machines when they go into practice, and generally must learn to resuscitate babies by simpler means.

The terms "asphyxia livida" and "asphyxia pallida" have been used here. Of course, there is no such thing as "asphyxia pallida." The oxygen lack in the pale and limp baby is due primarily to injury and not to asphyxia itself. Here we have the picture of a traumatized and shocked infant. Generally the injury is intracranial. The infant is limp, pale, and has a rapid thready pulse, because he is in profound traumatic shock. I wish we could get rid of the term "asphyxia pallida." I believe that if you cannot resuscitate the baby by warmth, gentle handling, a clear airway, and the use of oxygen you cannot resuscitate him at all.

Dr. Jacobs spoke of the premature baby. We should add to that the statement that if there is any suspicion of impending premature labor, it is of vital importance that we employ analgesics sparingly.

Dr. Kosmak asked about the figures on anoxia since the advent of the barbiturates. I have no figures on anoxia in relation to the barbiturates, but Snyder and Rosenfield showed that barbiturates administered to pregnant rabbits depressed the intrauterine respiratory motions of the fetuses more than any other drug, and Henderson believed that the barbiturates produced a block of the regulation of the respiratory center.

I believe that Dr. Cosgrove, in his discussion of a paper this morning, gave the best answer to the questions and to the points raised by Doctors Cornell and Bill. Paraphrasing his answer, of course there will not be any increase of the fetal mortality rate with the use of anesthesia and analgesia in the hands of master obstetricians, but in the hands of the general medical group of the country there will be an appreciable increase in fetal death rates. I have known instances where as much as twenty-five grains of nembutal were given a mother during the course of labor. Such practice often repeated will undoubtedly influence the mortality rates of the newborn infant.

## CARCINOMA OF THE CERVIX IN AN URBAN POPULATION\*†

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**T**HIS report gives a cross section of experience in treating cervical carcinoma in Dallas, Texas, from Jan. 1, 1936, to Jan. 1, 1946. The age distribution, the amount of time lost by patient and doctor between the onset of symptoms and the diagnosis of cancer, the frequency of inadequate or inappropriate methods of treatment and their relation to sequelae are stressed.

### Method

This study was begun by reviewing records of carcinoma of the cervix in the metropolitan hospitals in Dallas for the period 1936 to 1946. Many of the records were worthless. Often nothing but the name of the patient, the date of admission and discharge, and the clinical diagnosis were given. Additional information was obtained by cross-checking with the private radiologic clinics, which treat most cervical carcinoma, and the Registrar of Vital Statistics of the City of Dallas. For nearly two-fifths of the patients dying of cervical cancer in the city the primary cause of death was reported as carcinoma of the uterus or fundus uteri, or no mention was made of cancer. These results indicated the vital statistics were not an accurate index of cancer deaths. Finally the files were checked in four of the main pathology laboratories in the city. Records from these were excellent. Through the various channels described, data were obtained for 1,134 women who clinically had carcinoma of the cervix. It was believed these represented at least 90 per cent of the new patients seen with cervical cancer in the city during the ten years. The succeeding discussion is based on 992 women for whom the histologic diagnosis was available. Follow-up studies were obtained by sending a questionnaire either to the patient or to the family physician or to both, to ascertain whether or not the patient was living and whether there had been vaginal bleeding and pelvic pain after treatment. This procedure met with some passive resistance from physicians and patients' relatives. Some of the doctors felt the investigation was directed against them personally. Relatives were afraid the patient would learn she actually had cancer. These reasons plus change of address resulted in failure to trace more than one-fifth of the women. It was obvious that accurate statistical data could not be presented, instead only trends were determined. Five- and three-year survival rates were calculated, respectively, for the periods 1936 through 1940, and 1941 through 1943. The term "operable" carcinoma will refer to lesions limited clinically (Schmitz I and II) to the cervix and "inoperable" to those with extension of the cancer outside its borders (Schmitz III and IV).

Often the patient had undergone previous gynecologic operation. For the purposes of this paper it was necessary to make arbitrary decision concerning relation of previous operation to present cervical cancer. Operations performed within two years of recognition of cancer were considered done after the carcinoma appeared. If the operation antedated the diagnosis more than two years the cancer was assumed to have developed postoperatively.

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### Patients

One-third of the women were referred from smaller communities in Texas, Arkansas, Louisiana, and Oklahoma to Dallas for treatment, while the other two-thirds lived in the city. The number of patients in the pre- and post-menopausal period of life was approximately equal. Eighty per cent were white and the remainder Negro or Mexican. The age distribution is shown in Table I. Note that 5 per cent of the women were under 30 years of age. Contrast this figure with others ranging from 1.37 to 4.3.<sup>1-3</sup> The youngest patient was 19 years, and the oldest 87 years of age.

TABLE I. CARCINOMA OF CERVIX, AGE DISTRIBUTION

AGE (YEARS)	PATIENTS	
	NUMBER	PER CENT
Under 30	49	5.0
31-40	182	18.3
41-50	290	29.3
51-60	252	25.4
Over 60	162	16.3
No data	57	5.7
Total	992	100.0

### Symptoms

Most of the women sought consultation for vaginal bleeding or leucorrhea, while a small number gave a variety of complaints. Table II gives the duration of symptoms. It was impossible to correlate the duration with the clinical grade of the tumor. This may be a reflection of poor histories. Where the duration was known, the average delay from the onset to the time a diagnosis was made was 7.4 months; 6.4 wasted by the patient and one by the doctor. The delay was one to two months above the average for indigent and referred patients. The time wasted during 1936 and that in 1944 and 1945 was essentially similar, indicating that patients and doctors had not become more cancer conscious.

TABLE II. DURATION OF SYMPTOMS

DURATION (MONTHS)	PATIENTS	
	NUMBER	PER CENT
Under 6	442	44.6
6-12	173	17.4
13-24	65	6.6
25-36	32	3.2
No data	280	28.2
Total	992	100.0

### Pathology

Sixty of the patients had adenocarcinoma and 932 epidermoid carcinoma. Table III reveals the clinical grading according to the Schmitz Classification. Frequently the pelvic findings were described so tersely that this interpretation was impossible. Many physicians made no apparent attempt to utilize any type of classification. A number of women were treated by simple total or subtotal hysterectomy. Although the clinical grade of the tumor was unrecorded for less than one-half of those totally hysterectomized, sufficient data were available to indicate that most of the lesions were operable. Two-thirds of the women subjected to subtotal with unsuspected cancer had an inoperable tumor by the time the diagnosis was made.

TABLE III. SCHMITZ CLASSIFICATION

CLASSIFICATION	NUMBER OF PATIENTS
I	57
II	171
III	302
IV	174
Unclassified	290
Total	992

**Treatment**

For purposes of presentation, treatment was divided into two categories: that given before cervical carcinoma was suspected is shown in Table IV, and that administered after cancer was suspected is listed in Table V. The technique of administering x-ray and radium varied, but in general a total of 3,500 to 5,000 milligram hours of radium was delivered to the cervix and parametria. Two to three thousand roentgens measured in air were given to each of two pelvic ports located anteriorly and posteriorly. Patients hysterectomized usually received external irradiation postoperatively, rarely preoperatively. Where subtotal was done originally without suspecting cancer, an interval of three to twenty-four months elapsed before x-ray or radium, or both, were given. Approximately one-tenth of the women were reirradiated six or more months after the initial series of treatments. When done, it was usually for the purpose of palliation. It was apparent that the clinical grade of the tumor was more important than the method of irradiation in determining the future prognosis. Simple total and subtotal hysterectomy were performed with about equal frequency from 1936 to 1946 for missed or proved cases of carcinoma of the cervix. Two-thirds of the totals were done deliberately after the diagnosis was established or suspected, while one-third was performed without suspecting a malignancy.

TABLE IV. ORIGINAL TREATMENT OF PATIENTS WITH UNSUSPECTED CARCINOMA

TREATMENT	NUMBER OF PATIENTS
Subtotal hysterectomy	56
Total hysterectomy	17
Oral medication	14
Local treatment to the cervix	11
Estrogens	7
No examination or medication	6
Exploratory laparotomy	5
Bilateral oophorectomy	5
Hernioplasty	1
Total	122

TABLE V. TREATMENT

TREATMENT	PATIENTS		
	TRACED	UNTRACED	TOTAL
X-ray and radium	432	98	530
Total hysterectomy and irradiation	66	23	89*
Subtotal hysterectomy and irradiation	80	19	99†
Other gynecologic procedure and irradiation	8	2	10
Information incomplete	180	84	264
Total	766	226	992

\*Sixty of the total hysterectomies were performed deliberately after cancer was suspected. The other twenty-nine were done without suspecting carcinoma or the relationship was unknown.

†Fifty-six of these operations were done one to twenty-four months and forty-one, twenty-five months, or more prior to diagnosis. Information was unavailable for two others.

Blood transfusion was seldom used except in the terminal stages of the disease. Our impression was that some patients were unable to tolerate a full course of irradiation because of anemia.

### Results

Five- and three-year survival rates for patients traced are summarized in Table VI. The use of both x-ray and radium gave better results than either alone or in combination with total hysterectomy. The prognosis for those women who developed cancer in the cervical stump after subtotal hysterectomy was almost as good as for those who had cervical carcinoma with the fundus present. The survival rate was decidedly diminished for those who originally had a subtotal for unsuspected cancer probably because of two factors: more time was wasted in giving proper treatment and the growth of the tumor was aggravated. Irradiation treatment gave as satisfactory results for adenocarcinoma of the cervix as for epidermoid carcinoma.

TABLE VI. SURVIVAL RATES

CLASSIFICATION	FIVE YEAR (1936-1940)			THREE YEAR (1941-1943)		
	TOTAL	NUMBER LIVING	PER CENT	TOTAL	NUMBER LIVING	PER CENT
I	21	17	81	13	11	84.9
II	50	32	64	55	33	60
III	105	31	29.5	78	30	38.4
IV	62	3	4.8	42	7	16.6
Unclassified	91	23	25.3	61	28	45.9
Total	329	106	32.2	249	109	43.9

Nearly one-fourth of the women traced had known sequelae, exclusive of pain, attributed to the malignancy or to the treatment (Table VII). Sequelae were about 50 per cent more common among patients having pelvic operations than among those who were unoperated. This relationship was particularly true where extrapelvic metastases and local recurrence with vaginal hemorrhage developed. Vaginal fistulas were three times more common among women who were irradiated repeatedly than among those given only one course of treatment.

TABLE VII. KNOWN SEQUELAE TO THE DISEASE OR ITS TREATMENT

SEQUELAE	NUMBER OF SEQUELAE
Hydronephrosis and pyelonephritis	56
Fistulas (42 vaginal, 1 abdominal)	43
Vaginal bleeding with local recurrence	33
Extrapelvic metastases	26
Intestinal obstruction or stricture	24
Pyometra	5
Miscellaneous	4
Ascites	3
Pleural effusion	1
Total	195*

\*These involved 185 patients.

### Comment and Conclusions

This survey shows that women treated for carcinoma of the cervix in Dallas, Texas, from Jan. 1, 1936, to Jan. 1, 1946, did not seek consultation any earlier than did those living in other parts of the United States. Miller<sup>4</sup> found that

the patients admitted to the University of Iowa from 1917 to 1927 delayed going to the physician an average of six months after signs indicative of cancer appeared. Collins<sup>5</sup> and Diddle,<sup>6</sup> respectively, found the delay was the same between 1927 and 1933 and during 1941. Todd<sup>7</sup> gave a similar experience for the University of Michigan from 1931 to 1937. Apparently the educational programs put on by the American Cancer Society are not sufficiently inclusive or they do not reach far enough.

The doctor wasted six months in 1917 to 1927,<sup>4</sup> four months in 1927 to 1933, and 2.4 months in 1941<sup>8</sup> at the University of Iowa. The figures quoted by Todd<sup>7</sup> and Hoge<sup>8</sup> were 1.5 and 3 months. In spite of cancer campaigns waged by state and national organizations and the emphasis placed on the subject in the medical schools, results presented indicate there is still room for professional improvement.

Ostensibly the reason for doing simple total hysterectomy was to remove the immediate extension of the growth through the cervix. The risk of extirpating the regional nodes was probably regarded too great. But experience of others<sup>9-12</sup> has been that even though the carcinoma may be confined to the cervix, simple total hysterectomy does not always benefit the patient. Instead it may prove to be a hazard, probably because the outer layers of the cervix are sheared off during the operation.<sup>13</sup> From this analysis total hysterectomy followed by irradiation as contrasted to irradiation alone did not improve the chance for a five- and three-year survival. Actually certain types of sequelae were more common after total hysterectomy than in unoperated cases.

Five-year survival rates for cervical stump carcinoma range from 7.6 to nearly 49 per cent.<sup>14, 15</sup> The prognosis appears to be poorer when subtotal hysterectomy is done in the presence of unsuspected cervical cancer. Then spread of the tumor and waste of time decrease the probability of a five-year cure. Where hysterectomy is indicated, a total properly done offers no greater risk to the patient than the subtotal, and does remove the possibility of a malignancy developing in the stump later.<sup>16</sup>

The results reported compare favorably with those collected by Miller<sup>17</sup> and Heyman<sup>18</sup> from different parts of the world. Yet when it is considered that one-fifth of the women received questionable or inadequate treatment, it becomes apparent that the physician carried a responsibility for results not being better. A wider use of the diagnostic curettage and biopsy and proper visualization of the cervix would have originally given more positive diagnoses of cancer. Also, the general use of orthodox therapeutic methods undoubtedly would have improved the survival rates and reduced the number of sequelae.

Appreciation is extended to all those who made this survey possible including: the physicians who furnished follow-up reports, the staff of the Bureau of Vital Statistics of Dallas, the Superintendents of the hospitals, and the Chiefs of the various radiologic, pathologic, and obstetric and gynecologic services.

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### Discussion

**DR. JOE V. MEIGS**, Boston, Mass.—Dr. Diddle's analysis of the patients with cancer of the cervix in Dallas is of considerable interest. He was able to discover certain important facts in his 1,134 cases. The usual lack of data is obviously present in Texas as it is in many communities where there is no special group treating this disease. The treatment of cervical cancer should be confined to those groups of men who are interested and who have available all proper methods of treatment. Radiation treatment is very complicated and should be a very painstaking maneuver. The surgery of the early case and the surgery of the lymph nodes should be done by those surgeons who are truly qualified to carry out the procedures.

Supravaginal hysterectomy for cervical cancer has been done many times, and at the Pondville Hospital we have had two patients in the hospital at one time who had advanced cancer of the cervix upon whom a supravaginal hysterectomy had just been performed. This is inexcusable. Total hysterectomy except for possible cancer in situ should be condemned, for it will not cure the disease, and makes the future treatment very difficult. X-ray and radium in such cases are of very little value.

It is interesting to note the number of bowel injuries in the Dallas district. Twenty-four known cases is a considerable number, and in my discussions of this problem for the past two or three years I have emphasized that this is an important reason for the Wertheim operation. Certain roentgenologists from Texas are among those who have criticized this reason, for they state that they do not see bowel injury due to radiation. Recently in Colorado at a meeting a roentgenologist from St. Louis stated that he had never seen such a complication. I can say only that I am grateful to Dr. Diddle for calling to my attention that Dallas also has bowel injuries, presumably due to radiation.

I think the results of the radiated cases are satisfactory and measure up to the standard set throughout the world. I am equally sure that radiation treatment is not the only method of caring for this disease, and the next few years will demonstrate that combination treatments and selective treatment will prove definitely superior.

**DR. ROBERT E. SEIBELS**, Columbia, S. C.—A highlight of Dr. Diddle's presentation is that in the ten-year period from 1935 to 1945 there was no change in the stage of carcinoma of the uterus at the time the patient presented herself for definitive treatment. In other words, the patient had sought advice no sooner nor had the diagnosis been made more promptly in the last year than in the first year.

I am convinced that routine cytology studies could change the picture with relationship to diagnosis. We have found exactly the same percentage of unexpected carcinoma of the cervix in routine cytologic studies that Pund reported July 20, 1946, in his studies of cervices removed for other than suspected neoplasm. Through cytology we have a diagnostic measure which only requires to be used routinely to discover many cases of early carcinoma which would otherwise be missed.

Whatever diagnostic significance we may finally attach to positive cytological studies, that is whether they will substitute for or only impel a biopsy, they have already focused our attention sharply on the patient with distinctly abnormal cells and may push the clinician to a diagnosis sooner than waiting for the patient to bleed or develop the perfectly obvious lesion.

Ayre has suggested a method differing from the usual technique of securing the cells from the vaginal pool; his technique is to make spreads from the cervix by means of a wooden spatula made from a tongue depressor and by this method groups of cells can be found which occasionally have the value of a true biopsy. This is an extension of the method previously suggested of using the small metal cannula with a syringe to secure cells from the fundus and cervix.

**DR. DIDDLE (Closing).**—Dr. Meigs said he had been accused of causing an increase in the number of cases of carcinoma of the cervix treated by operative measures. I think really these methods have been used all the time and the bad results were not associated with the Wertheim operation but with use of the simple hysterectomy.

Dr. Seibel mentioned cytology in regard to the study of these patients. The main trouble here is that the patient does not come to see the doctor often before six months have elapsed after symptoms began.

## STAPHYLOCOCCUS AUREUS HEMOLYTICUS PUEPERAL MASTITIS AND INFECTIONS OF THE NEWBORN\*†

LUCIEN R. PYLE, M.D., TOPEKA, KAN.

(From the Department of Obstetrics, U. S. Naval Hospital, Brooklyn, N. Y.)

THE occurrence of infections, regardless of type or severity, is always a matter of deep concern to those charged with the responsibility of an obstetric department. It is the purpose of this paper to present a series of 42 infections occurring in the Obstetrical Department of the U. S. Naval Hospital, Brooklyn, from Jan. 1, 1945, to Dec. 1, 1945. Twenty-six of these were infections of the puerperal breast. The remaining sixteen were infections in the newborn, seven of which involved the breast. *Staphylococcus aureus hemolyticus* organisms were found in every instance where a culture was taken.

### Incidence

In reviewing the literature many interesting variances are found regarding the incidence of puerperal mastitis with or without suppuration.

TABLE I. INCIDENCE OF MASTITIS.

	DELIVERIES	CASES OF MASTITIS	PER CENT
Heaton <sup>1</sup>	5,000	39	0.78
Webringhaus <sup>2</sup>	4,000	88	2.2
Dorman <sup>3</sup>	2,000	57	2.8
Fulton <sup>4</sup>	1,404	126	9.0
Author	1,273	26	2.2

To show the lack of accord concerning the frequency of mastitis, Bland<sup>2</sup> quotes Webringhaus as reporting an incidence of 2.2 per cent, Dever and McFarland asserting that 1 per cent would be a fair estimate, while he himself thinks that one-half of 1 per cent would be more accurate. Fulton<sup>4</sup> made a survey of all cases of mastitis reported in an English industrial town of 43,000 over a period of twenty-eight months. He states his rate of 9 per cent is correct, with the exception that there were undoubtedly cases of mastitis that were not seen by or reported to the public health authorities. Another interesting fact in his series is that mastitis occurred in 16 per cent of women delivered in the hospital, as compared with 3.5 per cent of those delivered at home.

Fulton<sup>4</sup> states that the onset of mastitis was most common in the third week post partum, but that 45 per cent occurred in the fourth week. Dippel and Johnston<sup>6</sup> agree. Several writers made the statement that the delayed appearance of mastitis was responsible for the disparity between the figures as shown in Table I, since in many clinics the patient would not return to the obstetric service for care, but would report to the surgical service or to a local physician.

In a review of the medical records of mothers delivered in the U. S. Naval Hospital, Brooklyn, from Jan. 1, 1945, to Dec. 1, 1945, the following re-admissions were found because of breast infections.

In a clinical analysis of these infections, certain characteristics were rather uniformly present. Sixteen mothers breast-fed their babies until the onset of symptoms of breast infection. Four mothers were breast-feeding their babies when discharged from the hospital, but ceased nursing within ten days of the

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TABLE II. INCIDENCE OF MASTITIS TO DELIVERIES

MONTH	DELIVERIES	MASTITIS
January	113	
February	99	
March	120	2
April	95	3
May	122	
June	123	6
July	124	10
August	131	1
September	125	4
October	116	
November	105	
Total	1,273	26

onset of breast symptoms. Six mothers nursed their babies less than five days. The appearance of breast symptoms after delivery was quite delayed, the average period being twenty-five days post partum. The shortest period was seven days, and the longest was forty-three days. Twenty-five patients had afebrile postpartum courses and were discharged from the hospital ten days after delivery. In most instances the onset of the symptoms was quite insidious, beginning with soreness and swelling near the nipple. With one exception the lesions were unilateral. Most of the patients had not more than 1 or 2 degrees of fever. Only two patients had a definite history of a chill.

On examination, in most instances there was a subareolar induration. In those cases where suppuration developed, the abscesses were almost all nearer the nipple than the periphery of the breast.

Eleven cases were seen sufficiently early to institute conservative therapeutic measures. Five of these patients received small repeated doses of low voltage x-ray according to the technique outlined by Dr. Harriet McIntosh.<sup>7</sup> In addition, they received 30,000 units of penicillin every three hours. Two patients received sulfadiazine and ice packs. Fifteen patients were seen too late for conservative therapy, and they were treated by incision and drainage. Twelve of the fifteen abscesses were cultured, and all were reported positive for *Staphylococcus aureus hemolyticus*.

Winder,<sup>8</sup> as early as 1899, reported four cases of suppurative mastitis in the newborn, one case of which came on after a suppurative mastitis in the mother. For treatment he advised "foment and leave alone."

In a review of the medical records of the newborn in the Naval Hospital from June 1, 1945, to Nov. 1, 1945, there was the following incidence of superficial infections.

TABLE III. INCIDENCE OF NEWBORN INFECTIONS AS COMPARED TO BIRTHS

MONTH	BIRTHS	MASTITIS	PUSTULES	PARONYCHIA	FURUNCLES
June	123	2	3	1	1
July	124	3			1
August	131		2		
September	125	2	1		
October	116				
November	105				
Total	724	7	6	1	2

In the June infections a culture of one breast abscess was positive for *Staphylococcus aureus hemolyticus*. The mother of one baby who had pustules developed a breast abscess with a positive culture for *Staphylococcus aureus hemolyticus*.

In July, two breast abscesses and a furuncle of the neck were reported positive for *Staphylococcus aureus hemolyticus*. The other case of mastitis re-

solved without drainage. The mother of the baby with acute mastitis, however, subsequently developed an acute mastitis which resolved after conservative therapy.

In August, from 131 births there were two cases of pustules. In September, from 125 births there were two breast abscesses and one case of pustules. Positive cultures for *Staphylococcus aureus hemolyticus* were obtained from both breast abscesses. None of the mothers of these babies developed infections.

### Source of Infection

With only five cases of mastitis occurring out of 549 mothers delivered in the first five months of the year, our suspicions were not aroused. In fact, it was not until the last week in July when four mothers were admitted with acute suppurative mastitis in addition to the development of three cases of mastitis in the newborn that we became disturbed. This was mainly because of the delayed appearance of the cases of acute mastitis in the mothers.

In a brief review of the literature that we had available, we found one report that gave us a clue to our situation. This was a short editorial appearing in *Lancet*<sup>9</sup> in 1936, which I quote:

"An outbreak of mastitis was reported among mothers at the Ilford Maternity Home associated with dermatitis among the infants. The outbreak was not confined to the Maternity Home, other cases of mastitis occurring in the district, and investigation was made more difficult by the fact that some of the abscesses did not develop until a month or more after confinement.

In every case it was found possible to identify the infecting organism as *Staphylococcus aureus*. Careful examination of all of the possible fomites gave no clue to the source of the infection. The staphylococcus, however, was found in the nose and throat of the women who fell ill with mastitis. Swabs of the mothers and the babies showed 40 per cent of the babies in the home carrying *Staphylococcus aureus* in their throats, and an equal number of mothers carrying it in their noses and throats.

The investigators thought that the probable sequence of events was: the mother carrying the organism in her nose and throat infected the baby's throat, and the baby in turn infected the mother's breast when sucking."

Subsequent review of the literature has brought out the following points. Parker<sup>10</sup> in 1884 stressed the "epidemic influence as a predisposing cause." In 1925 Mellon, Caldwell, and Winans<sup>11</sup> suggested that outbreaks of pemphigus neonatorum are or may be from breast milk and cite some cases with early cultures to prove their point. Bland,<sup>2</sup> in 1927, stated that in 98 per cent or more of parturient patients the breast milk was found to contain all of the various types of staphylococci, or other microorganisms of the pyogenic group. Benians and Jones<sup>12</sup> demonstrated that of healthy mothers in the puerperium, 15 per cent harbored *Staphylococcus aureus* in their throats, and 17 per cent in the breast milk, and yet their infants came to no harm. Other authors have given percentages between these two extremes. Cass<sup>13</sup> proposed a theory that, although the *Staphylococcus aureus* is constantly present in the surroundings of the newborn, it is pathogenic to only a few. When it is pathogenic to one, however, its virulence is increased, so that other infants are exposed to more virulent forms. Knott and Blaikley<sup>14</sup> made rather exhaustive bacteriologic studies of five outbreaks of *Staphylococcus aureus* infections occurring in the Guy's Hospital in 1942. In these studies they graded the organisms by cultural methods into grades A, B, C, and D. In all epidemics, grades A and B were found to be etiologic agents, while grades C and D were considered non-pathogenic. They particularly stressed the importance of the hands and other forms of direct contact in the spread of these infections. One outbreak was attributed to nurses and attendants using a common workroom with nurses from

an adjacent surgical ward where there were draining cases. Another outbreak was caused by a nurse who had positive nose and throat cultures for *Staphylococcus aureus*. A third source was a prepartum patient admitted to the ward with a severe antral infection. Babies, nursing mothers, and attendants were victims of the infection. Benians,<sup>15</sup> in a study of an outbreak of impetigo, states that identification of types or strains bore no relationship to pathogenicity but was of value only in correlating and identifying strains from different sources.

In addition to reviewing the literature, the chiefs of staff of two metropolitan hospitals were consulted concerning their experience with similar infections. Both of these physicians professed that they had no experience with infections of this type. After discussing our routines of breast care and nursery technique, they neither suggested changes nor additions.

With meager information at hand, it was decided to attempt to trace the source of the infections, since we felt that the before quoted editorial from Laneet gave us the best lead.

On Aug. 7, 1945, all of the personnel and civilian maids associated with the maternity wards and nurseries had nose and throat cultures taken.

TABLE IV. NOSE AND THROAT CULTURES—WARD PERSONNEL, AUGUST 7, 1945

	NURSES	WAVES	MAIDS	DOCTORS	TOTAL
Cultures	32	16	6	9	63
Cultures positive—S.A.H.	9	7	2	2	20
Per cent positive cultures	28.1	43.7	33.3	22.2	31.7

With this rather surprising result, we felt that every person with a positive culture should be removed from duty on the obstetric floor if possible, and replaced by personnel with negative cultures. Therefore nurses and Waves from other duty stations had nose and throat cultures taken.

TABLE V. NOSE AND THROAT CULTURES ON PERSONNEL NOT ASSIGNED TO THE MATERNITY WARDS, AUGUST 8, 1945

	NURSES	WAVES	TOTAL
Cultures taken	16	23	39
Cultures positive—S.A.H.	3	9	12
Per cent positive cultures	18.3	39.1	30.7

The fact that the percentage of positive cultures in personnel from other departments was comparable, although not quite as high as in our own personnel, made us think that the source of the infection could not be traced to a single carrier or so in our department, but that the source of infection must be more epidemic in character. A higher incidence of positive cultures occurring in the waves than in the nurses would also be positive evidence, though

TABLE VI. NOSE AND THROAT CULTURES TAKEN ON MOTHERS

	WARD E-3-S	DEPENDENTS WARD	TOTAL
Cultures taken	19	21	40
Cultures positive—S.A.H.	9	4	13
Per cent positive cultures	47.3	19.5	32.5

each group lived in quarters, the nurses were not as closely associated in living quarters, transportation, and social activities.

On August 11, all of the patients and babies on the two wards and four nurseries had nose and throat cultures taken.

These findings substantiate, somewhat, the epidemic tendencies of the infection since Ward E, 3 South was a ward composed of units of four to six

TABLE VII. NOSE AND THROAT CULTURES TAKEN ON NEWBORN

	WARD E-3-S	DEPENDENTS WARD	TOTAL
Cultures taken	21	24	45
Cultures positive—S.A.H.	3	5	8
Per cent positive cultures	16.6	20.8	18.7

beds, whereas the Dependents Ward contained only private or two-bed rooms.

The series of cultures in the newborn is interesting from two standpoints: First, there was a lower incidence of positive cultures in Ward E, 3 South, where there was the highest incidence of positive cultures in the mothers. Second, the pediatrician who took care of the infants in Ward E, 3 South nurseries had a negative culture, whereas the pediatrician in the Dependence Ward nurseries had a positive culture. Incidentally, he had had a carbuncle shortly before the outbreak of the epidemic and he also developed an infection on his hand from which a positive culture of *Staphylococcus aureus hemolyticus* was obtained. He continued to have a positive nose and throat culture after treatment had been instituted.

Cultures from the nursery floors, bath tables, soap dispensers, etc., were repeatedly negative.

#### Control Measures

With this information at hand, the necessary measures to control the spread of the *Staphylococcus aureus hemolyticus* infections were considered. Closing down the ward to new admissions was discussed, but this did not seem to be the answer unless the personnel were treated at the same time. Therefore, the following measures were decided upon and instituted.

1. All nurses and Waves with positive cultures were replaced with similar personnel with negative cultures.
2. All of the personnel were required to wear clean masks when caring for a patient or entering her room.
3. All of the babies who had positive nose and throat cultures and babies of mothers with positive nose and throat cultures were removed from the breast and formula fed in the nurseries.
4. The nursery routines were reviewed and their importance stressed. The walls and equipment were thoroughly scrubbed.
5. All of the personnel with positive nose and throat cultures were required to report to the nose and throat department twice daily for treatment until negative cultures were obtained. It was decided that penicillin spray would probably be the most effective form of therapy.
6. All of the personnel were cultured at ten-day intervals.

#### Results

The results of the measures instituted were noted almost immediately. Of the 131 mothers delivered in August, only one developed a breast abscess, as compared with ten of the 124 delivered in July. In August there were two cases with pustules in babies as compared with one abscess in the neck, two breast abscesses, and one acute mastitis in July.

This table gives the repeat cultures on nurses, maids, and doctors who had previous positive cultures and were under treatment for the same.

TABLE VIII. NOSE AND THROAT CULTURES

	NURSES	WAVES	MAIDS	DOCTORS	MOTHERS	NEWBORN
Cultures taken	73	16	8	8	43	45
Cultures positive—S.A.H.	8	4	1	1	7	3
Per cent positive cultures	13.6	25	12.5	12.5	19.4	6.6
Per cent positive cultures on first cultures	28.1	43.7	33.3	22.2	32.5	18.7

About September 15, the required wearing of masks in caring for patients was dispensed with. No infection developed in either mothers or babies delivered during the first fourteen days of September. It is interesting to note, that, in the patients delivered between September 13 and September 24, following the time when the restrictions were lifted, in babies there were two cases of breast abscesses and one case of pustules and in the mothers there were four cases of breast abscesses. During the last five weeks covered by this report there were no new cases of *Staphylococcus aureus hemolyticus* infection in mothers or babies.

### Conclusions

In conclusion there has been presented: first, a series of forty-two infections occurring in mothers and newborn babies, in which positive cultures of *Staphylococcus aureus hemolyticus* were obtained in all of the sixteen instances where cultures were taken; second, the methods used in attempting to ferret out the source of the infections; and third, the measures that were instituted to control the infections.

Although this series was small and the cultures on patients and personnel were less frequent than was desirable, the evidence as presented would seem to indicate that the source of these infections was from asymptomatic carriers harboring the *Staphylococcus aureus* organism in their nasopharynx, to mothers or babies, or both.

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### Discussion

DR. LESTER A. WILSON, Charleston, S. C.—That Dr. Pyle's reported incidence of mastitis of about 5 per cent in June and of 8 per cent in July is much higher than is usually the case. In a series of 1,000 consecutive private cases followed through lactation, I found an incidence of breast infections in the mother of three-tenths of 1 per cent, and in the infant the incidence was one-tenth of 1 per cent. One case of breast abscess in a newborn was due, I concluded, to a practical nurse or to an impractical grandmother who massaged the breast with castor oil to reduce the swelling which had resulted from congestion so frequently seen in the newborn.

This report again demonstrates the fact that practically all epidemics in maternity wards are human borne, and that the vast majority of them come from the upper respiratory tract of an attendant. The chief exceptions are epidemics caused by the intestinal flora now so prevalent in nurseries.

After I had read Dr. Pyle's paper, I asked a bacteriologist and epidemiologist the following questions:

1. Why were there no puerperal infections of the genital tract, when breast infections and symptomless respiratory tract carriers were so prevalent? He replied, and I quote, "I am certain that there are strains of pathogenic organisms, especially staphylococci, which

develop a predilection for certain tissues. In this epidemic, the predilection was for epithelial tissues."

2. Why did the infections of the breast become manifest about twenty-five days post partum and about fifteen days after hospital discharge; was this contamination acquired in the hospital? The bacteriologist stated that he agreed with Dr. Pyle in his deduction that the infection must have been carried to the mother's nose and throat where it remained until conveyed in some manner to her breast.

The original source of the respiratory infection in Dr. Pyle's series is speculative. I am inclined to agree with him when he states that the evidence would seem to indicate that the infections came from asymptomatic carriers of a virulent strain of *Staphylococcus aureus hemolyticus* in their throats. I suspect that the ultimate source of the infection was probably the attendant who had a carbuncle and an infected hand.

I recall an epidemic of impetigo in one of our nurseries some years ago that immediately disappeared after we discharged a maid who was carrying supplies to this nursery and who had a low grade skin infection on a covered part of her body.

It is wise to begin to search for possible human carriers, just as soon as an infection of any type appears in a maternity ward. A system of routine inspections of the personnel of our maternity wards would seem to be wise.

DR. GEORGE W. KOSMAK, New York, N. Y.—Could Dr. Pyle give us some information about the nipples in these patients? I do not believe he made any reference to that.

DR. FREDERICK H. FALLS, Chicago, Ill.—This careful study of staphylococcus infection in a maternity ward should not be allowed to go without more discussion. Dr. Pyle is to be congratulated on the zeal with which he went after this epidemic and ran it down.

I have been interested in pemphigus neonatorum since 1915 when a series of epidemics in Chicago were studied by me and I found the organism which had been previously described as the cause by Clagg and Wherry working in the Philippines. Before that these organisms were said to be streptococci. The organism is like a streptococcus in smear, but when cultured it is found to be *Staphylococcus aureus*. I cultured it, put in my own arm, and produced a typical lesion and recovered the staphylococcus from the lesion in my arm, which fulfilled the requirements of Koch. Since then I have been interested in learning where these epidemics of pemphigus come from, and it is important to remember that a pemphigus lesion may come from a nonpemphigus lesion. I think there is no question that the obstetrician with a carbuncle or infected hand is the person to be most under suspicion in connection with this epidemic.

Furthermore, I have shown this in the study of a breast abscess that occurred in a newborn. When I was at the University of Iowa one of my associates was demonstrating the "witches milk" in a male infant's breast. He squeezed the breast, and in about twenty-four hours there occurred a breast abscess and near that, after the abscess had been opened in two hours a pemphigus neonatorum lesion occurred showing the relation between the two types. And of course in the abscesses in the mother that are associated with epidemics of pemphigus is well known. They had to close the ward in the county hospital at one time because of an epidemic. We found that one of the night women who passed the babies out to the mothers had severe acne. The disease was totally unsuspected or that she was the source of the epidemic, but as soon as she was eliminated from the ward the cases of pemphigus disappeared. I think that whenever a pemphigus develops in the ward we should examine the personnel, not for gross evidences of infection, but for minor things such as an acne or a hangnail or a little boil on the neck which is the probable source of the epidemic.

DR. PYLE (Closing).—In reply to Dr. Wilson concerning puerperal infections, there may have been an instance or two in that time of low grade puerperal infection. I do not have the figures on that. However, I know that the isolation wards were filled with mothers of babies who had infections. The infection of the babies occurred while they were in the hospital, whereas the mothers' infections were of the delayed type.

I cannot answer Dr. Kosmak's question about the nipples.

## HYSTEROSTOMATOMY\*

LOUIS H. DOUGLASS, M.D., AND JAMES H. GRAVES, M.D., BALTIMORE, MD.

(From the University of Maryland School of Medicine)

**H**YSTEROSTOMATOMY or the operation of cutting the cervix was first described in detail by Dührssen in 1890, although it had probably been in use for some time prior to this. His contribution to the subject was so outstanding that the operation is frequently spoken and written of as "Dührssen's incisions." This term is not only cumbersome, but does not describe what is done and should be abandoned in favor of the descriptive one, hysterostomotomy. This suggestion was also made in 1933 by Randall. It is so indexed in the ninth edition of DeLee, revised by Greenhill.

The American literature on this procedure is not voluminous, and the attitude of many of the obstetricians of this country seems to be well expressed by Stander, who states that it is "freely employed in Germany, but only occasionally in this country." The reason for this feeling is not clear, but possibly is due to unfamiliarity, not only with the operation itself, but with the postpartum cervix.

Apropos of this, DeLee, in 1927, stated that for several years he had made it a practice to routinely inspect the cervix immediately post partum and to repair all cervical lacerations. He urged at that time that others adopt this same practice, and reported that there was no increase in morbidity as a result of it. The same recommendation is found in *Puerperal Gynecology* by Bubis, and in articles by Siegel, Goodhand, and others. It has been our practice for quite a number of years to follow this teaching, and we have found it not only without danger to the patient, but of decided benefit; in that many of the repaired cervicces have healed by primary union and the external os again presents a round, small opening rather than a transverse slit, or several ragged tears. Upon occasion, routine cervical inspection has disclosed an unsuspected early partial inversion of the uterus. Replacement in this phase is extremely simple and without shock. In addition to these, the operator becomes proficient, and is quite at home in the face of a cervical laceration requiring repair because of hemorrhage. And should the occasion arise to cut the cervix, he approaches the patient with confidence and with assurance.

Cervical inspection itself is rather simple, requiring only an assistant and three sponge sticks. Following the delivery of the placenta and the routine administration of the oxytocic drug, the perineum is depressed by a piece of gauze. With a sponge stick the anterior vaginal wall is raised and the anterior lip of the cervix drops into view. Grasping it and allowing this sponge stick to remain in place, it is a very simple matter to "walk around" the cervix with

\*Read at the Fifty-Eighth Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Hot Springs, Va., Sept. 4 to 6, 1947.

the other two. Should a laceration be observed, slight traction plus retraction of the vaginal wall will almost always give adequate exposure for repair.

Practically everyone who has written about primary cervical repair or hysterostomotomy has recommended and, in some instances, insisted upon the use of interrupted sutures. We followed this technique originally but about seven years ago began using a continuous, lock suture. There have been no breakdown of these repairs and, after carefully comparing the result, we are convinced they are as good as when the sutures were interrupted. Certainly a continuous, lock suture is quicker and easier to put in place.

Having routinely inspected cervices for a time, it seems quite simple to incise the cervix, when indications arise and when conditions permit. In the period covered by this report—twelve years—hysterostomotomy has been done at the University Hospital, in Baltimore, 229 times. These figures include seventy-eight cases reported from this clinic by Siegel in 1940. In this period 29,259 women were delivered of viable infants, so that the incidence was 1 in 128 deliveries.

TABLE I. INCIDENCE

AUTHOR	INCIDENCE
Shir	1 in 161
Randall	1 in 267
Hunt & McGee	1 in 67
Huber	1 in 100
Present series	1 in 128

Shir reports an incidence of 1 in 161 deliveries. Randall 12 in 3,200 or 1 in 267, Hunt and McGee 1.48 per cent, or 1 in 67, and Huber 1 per cent, or 1 in 100 deliveries. From this it may be concluded that the indications vary with the operator. For example, Walker states that in his hands rest and support will overcome most of his cases of cervical dystocia, and when this fails apparently has recourse to abdominal delivery. Sackett, in 1947, found that manual and forceps dilatation would usually suffice when interference was indicated in the presence of an incompletely dilated external os. Of these 229 patients, 201, or 87.8 per cent were primigravidae, and 28 had had one or more children prior to this one. So, as has been previously pointed out, the necessity for this procedure is most frequently encountered in first labors.

Of a bit more than passing interest is the fact that 146, or 63.8 per cent, were private patients, and only 83 were service. Since roughly one-half of all deliveries are of service cases, there appears a definite discrepancy here. Does fear in the more highly strung parturient cause spasm and interfere with dilatation of the external os, as Read contends? If that be true, the modern trend toward analgesia should reduce the necessity of hysterostomotomy. Randall felt that this was true, and in the present series we find that the incidence in the first six years was 1 in 86 deliveries, while in the second half it was 1 in 181. Only 34 per cent of the patients were under 25 years of age, 66 per cent being from 25 to 42 years old.

The indications are listed in Table II.

TABLE II. INDICATIONS

MATERNAL	ALONE	COMBINED MATERNAL
Maternal exhaustion	29	21
Lack of progress	33	10
Cervical dystocia	41	13
Uterine inertia	21	7
No indication stated	16	
Cephalopelvic disproportion	11	
Transverse lie	3	
Positional dystocia	2	
Miscellaneous (1 each)	10	
	166	51
FETAL	ALONE	COMBINED WITH MATERNAL
Fetal distress	2	17
Irregular fetal heart	7	2
Cervix about neck in breech deliveries	6	1
Prolapsed cord—2 were also breech	4	1
Meconium in vertex	4	2
Absence of 1 fetal heart in twin pregnancy	1	
	24	23

In 190 of the 229 cases it was possible to determine a single dominant indication. Of these, 166 were maternal and twenty-four fetal. It is our impression, in reviewing these case histories, that in some instances the operation was ill chosen (eleven cases of cephalopelvic disproportion, twenty-one of uterine inertia, and probably some of the sixteen in which no indication was stated). In addition there are others in which the indication as given was insufficient, and the operation probably unnecessary (irregular fetal heart, seven cases, and four of meconium in vertex presentations). The lowered incidence of the second half of the period covered by this report tends to substantiate this contention.

There were forty-one instances in which cervical dystocia was given as the indication. It is recognized that many do not agree that there is any such entity as "primary cervical dystocia," however, in our experience there does appear the occasional ease of prolonged labor, for which the only explanation seems to be a cervix which refuses to dilate, and upon examination appears to be unduly resistant. It is this type of ease which we have classified as "cervical dystocia."

The twenty-nine cases of "maternal exhaustion" and the thirty-three of "lack of progress" could probably be better classified. A review of their histories in some instances pointed to a different indication, but it was felt wiser to make no changes. Cervical dystocia would have been the most frequent corrected indication in these two groups. In breech presentation, usually with a small, poorly developed, or a premature baby, it occasionally happens that the body and shoulders of the child will pass through a cervix not sufficiently dilated to permit passage of the head. Here, hysterostomotomy, while technically more difficult than in vertex presentations, is often the only means by which we have any hope at all of obtaining a living child. By the use of bandage scissors in this type of ease the danger of injuring the baby is lessened. Reviewing the histories of the entire group it was found that twenty-five of the 229 (11 per cent) had premature rupture of the membranes, twenty had artificial rupture to induce labor (8.7 per cent), and in thirty-one or 13 per cent, the membranes were ruptured artificially before complete dilatation. Therefore in seventy-six instances, or one-third of the entire number, there was a premature rupture of the membranes.

TABLE III. DURATION OF LABOR

Under 25 hours	71	31%
25 to 50 hours	103	45%
50 hours plus	55	24%

Our criterion for prolonged labor is one which lasts for more than twenty-five hours. On this basis 158, or 69 per cent, of the total were so considered. Of the seventy-one cases in which labor was less than twenty-five hours in duration, seventeen were multigravidae, the indications for cutting the cervix being fetal.

#### Technique

Everyone who has written about hysterostomotomy has stated that the cervical canal must be completely obliterated or effaced before incisions can be made with safety. Also, that there must be no mechanical obstacle to delivery from below. With both of these statements we are in full accord; indeed, they are so self-evident that they need no supporting argument at this time.

On the other hand, we would like to take issue, rather mildly but still rather definitely, with another statement, or possibly inference which is frequently encountered. That is, as to the difficulty of doing a hysterostomotomy and the possibility of serious extensions of the incisions. Huber felt that the operation was "not without danger" of extension and of grave or even fatal hemorrhage. DeLee-Greenhill emphasize the seriousness of the operation; Beck says it should be classed as a major surgical operation and almost without exception are the difficulties and the dangers so emphasized that one finds little encouragement to undertake it. It is not our intention to claim that cutting the cervix is so simple and without danger that anyone with a minimum of training can do it with complete safety. On the other hand, it is our contention that with general obstetric experience and preparation by a period of routine inspection of all cervices after delivery, a hysterostomotomy can be done with complete assurance. The conditions mentioned earlier must, of course, be present, but when they are, the operation itself is comparatively simple.

The usually recommended locations of the incisions are at 10, 2 and 6 on the clock. Experience confirms these sites as the most satisfactory. The number of incisions and their depth naturally depend upon the amount of dilatation of the external os when the operation is begun. In some of our cases it was felt that one incision was sufficient, but in the majority two were used; and since 6 o'clock is the most awkward of the three locations, both to incise and to repair, in these the incisions were practically always at 10 and 2.

Hemorrhage following incision does not appear to be a great problem. In most of the cases in which hysterostomotomy was done, the cervix appeared to have less than the usual blood supply, and bleeding from this source was surprisingly slight. Only seventeen of this series showed a total blood loss from all sources of more than 500 e.c. (7.8 per cent).

Extension to the degree that it caused hemorrhage or was difficult to repair, has been a very minor complication. A slight one did occur forty-four times, divided as shown by Table IV.

TABLE IV. NUMBER OF INCISIONS\*

NUMBER OF INCISIONS	EXTENSION OR LACERATION	PER CENT
1—34 cases	11	32.3
2—174 cases	33	18.9
3—15 cases	0	0

\*In six cases there was no record of the number of incisions.

On the other hand extension was confined almost entirely to the earlier cases of the series and, as experience has increased, the incidence has lessened to the point where it is now quite rare.

For the past five or six years it has been our practice to repair the cervical incisions as we repair spontaneous lacerations; that is with a continuous suture. The results of this technique have been entirely satisfactory, and there seems no reason to discontinue it. The proof of this statement we believe will be found later in the analysis of the follow-up reports.

The type of delivery and the resultant fetal mortality is shown in Table V.

TABLE V

TYPE OF DELIVERY	NUMBER OF CASES	FETAL DEATHS	PER CENT
High forceps	5	4	80
Midforceps	112	24	21.4
Low forceps	81	7	8.6
Breech extraction	23	6	26
Version and extraction	12	3	25
Destructive operation	4	4	100
Spontaneous delivery	1	0	0
Total	238*	48	20.1

\*Seven sets of twins and one set of triplets.

Studying this table, several facts are quite apparent. First, high and mid-forceps operations carry an almost unavoidably high fetal mortality rate. Many of our cases so treated would unquestionably have been better handled by abdominal delivery, but, because of errors in judgment of the attending physician, admission late in labor, or other reason, the optimum time for this type of delivery had passed and forceps delivery after hysterostomotomy became an operation of necessity, rather than one of choice.

Of the forty-eight babies who were lost, three had anomalies incompatible with life, two were under 1,500 Gm. in weight, one was macerated, and one died of erythroblastosis. If we may be allowed to deduct these seven deaths, we are left with forty-one, or a corrected fetal mortality of 17.2 per cent. This does not compare favorably with some of the other reports, particularly that of Huber, with a fetal mortality of only 13 per cent.

TABLE VI. PRESENTATION

Occiput anterior	51 cases
Occiput transverse	84 cases
Occiput posterior	70 cases
Breech	25 cases
Transverse lie	4 cases
Brow	3 cases
Face	1 case
	238

In 187 instances, or 75 per cent, of the total, the presentation was abnormal.

In this series of 229 cases the maternal mortality was 1 or 0.4 per cent.

This death occurred in 1935, the first year covered by the report. The patient was a primigravida, 30 years old, admitted to the hospital with ruptured membranes, and having been in labor some forty hours. Her temperature, pulse, and respirations on admission were 100.6° F., 120, and 28. She was given intravenous glucose and sedated, delivery being postponed. After about twenty hours, during twelve of which she slept soundly, her distress again became acute, and delivery imperative. Hysterostomotomy was done on a 6 cm.

cervix, midforceps were applied to the head in the left occipitotransverse position, and delivery completed in twenty minutes. The child which was born alive and weighed 7 pounds 6 ounces lived only three hours, dying of intracranial hemorrhage. Some three hours after delivery, the patient "went into shock" and, despite treatment, died forty-one hours later. The final diagnosis was "toxic ileus and postpartum shock." Total duration of labor was sixty hours and fifty-six minutes. Blood loss was 800 c.c. Unquestionably this was a preventable death.

The maternal morbidity was 46.7 per cent, which does not appear to be abnormally high, when the type of case in which the operation is done is taken into consideration.

It was impossible to obtain follow-up notes on all of these patients; in 157 instances they were sufficient to be of use. The cervix was classified, as shown in Table VII, as well healed, poorly healed, and not healed. Also adhesions to the fornix of the vagina are listed. By well healed is meant that no evidence of the laceration or incision is present, and by poorly healed, a nick or small laceration was found. It was gratifying to note that 61.8 per cent of those examined could be classed as "well healed." Upon comparing the results of the repair with interrupted and with the continuous lock suture, it was found that 84 per cent of the former, and 81 per cent of the latter were classed as either well healed or healed. When the continuous suture was used, only 1 per cent of the patients showed scarring or adhesions. With the interrupted suture this figure was 5 per cent.

TABLE VII. RESULTS

	NUMBER	PER CENT
Well healed	90	61.8
Healed	32	20.4
Not healed	22	14
Adhesions	6	3.8
	157	100

There are available the records of eighty-six of these patients who have been pregnant one or more times since the operation. Balard, in 1922, reported that, in his experience, cervical incision (repaired) did not interfere either with fertility or with subsequent cervical dilatation. He thought there might be a slight increase in the abortion and premature labor rate. Shir stated that hysterostomotomy did not interfere with subsequent labors. Hunt and McGee and Huber reached similar conclusions.

Our findings are very much in accord with these authors. Only six abortions were encountered and one premature labor. There is no reason why a well-healed cervical laceration or incision should cause either abortion or premature labor. The incidence should be less than when no repair is done. There were no patients in this group having prolonged labor which could in any way be attributed to the previous operation, nor was sterility encountered in but one case, although many of the patients' subsequent histories were unattainable.

Of the eighty-six patients, three were undelivered, and there was one ectopic pregnancy. Of the seventy-four who delivered at term, there were seven sections, and one repeat hysterostomotomy. The remainder were normal with no maternal mortality and two fetal deaths.

### Summary

1. Routine cervical inspection and the repair of all lacerations are simple procedures without danger, and of decided benefit to the patient.

2. Hysterostomotomy occupies a definite, though limited, place in the delivery routine.
3. In this presentation, the incidence is too high, and many of these patients should have been handled differently.
4. When the operation is properly indicated, the results for both mother and baby are probably better than could be obtained in any other way.
5. When the operator has familiarity with the postpartum cervix, hysterostomotomy and repair offer little technical difficulty.

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### Discussion

DR. L. M. RANDALL, Rochester, Minn.—The essayist has called attention to a very useful and sound obstetric procedure. That it is infrequently to be employed does not detract from its value where the proper indications and conditions exist. Writing on this subject, fifteen years ago it was stated that hysterostomotomy should not compete with cesarean section. As an anticipated method of delivery where valid indications for cesarean section exist there should be no competition; however, when the following conditions are present, namely, no cephalopelvic disproportion, engagement of the presenting part, complete effacement of the cervix, dilatation of the os to 5 cm. or more after an adequate trial of dilatation, together with maternal or fetal indications for delivery, then I believe hysterostomotomy is preferable to cesarean section. In our experience it has been followed by no maternal mortality. The morbidity incident to the procedure is difficult to evaluate, owing to other circumstances usually associated with patients in whom hysterostomotomy is performed.

I am not certain of the definition for cervical dystocia. Numerous factors probably are present in the case finally so diagnosed. When a parturient has labored many hours through periods of analgesia and through periods of time without pain relief, has kept in good general condition, and disproportion does not exist but complete dilatation of the cervix fails to occur, we may well be dealing with cervical dystocia. Hysterostomotomy then becomes a very useful procedure, certainly preferable to manual laceration. This operation is designed to remove the impediment of the undilated cervix. The number and depth of the incisions in the cervix will be determined by the size of the presenting part and the amount of dilatation of the cervix. If one is in doubt, it seems preferable to make the three incisions at ten, two, and six and to carry them almost to the vaginal fornix. If this is done subsequent laceration of the cervix is less likely to occur. The procedure can be performed under anesthesia sufficiently light to allow uterine contractions to continue. This often results in descent of the

presenting part and elevation of the cervix after the incisions have been performed, so that subsequent trauma to the incised cervix is minimized.

The method of suture seems a matter of individual preference, but it is desirable to be certain that the initial suture secures a good bite of tissue above and at the apex of the incision. From this area bleeding most likely occurs.

Our first report on this procedure concerned an incidence of twelve in 3,200 deliveries (1 in 267). In another group sampled some years later, seventeen hysterostomatomies were performed in 4,568 deliveries, an almost identical incidence. The latter group occurred when methods of obstetric analgesia and anesthesia were considerably augmented and improved, perhaps indicating that there will always be a small group of patients in which this operation will be useful.

DR. SAMUEL A. COSGROVE, Jersey City, N. J.—I cannot accept an apparent endorsement of Dührssen's incisions as going out from this organization without protest, because the use of those incisions, except in the very rarest circumstances, seems to me wrong. I am one of those whom Dr. Douglass has referred to who does not believe in the existence of such an entity as cervical dystocia.

Dr. Douglass, I am sure, would accept Dr. Randall's conditions for the proper exhibition for Dührssen's operation. If he does, then the operation has eliminated the sole obstacle to delivery which he recognizes in his cases and his fetal loss should be thereby practically nothing. In his cases, therefore, there must have been other factors militating against fetal survival than the mere failure of the cervix to dilate. This is proved because he lost more than one of five babies. His paper itself would appear to me to very strongly substantiate that contention.

The trouble, I think, is that none of us is quite able to accurately meet the conditions which Dr. Randall has laid down. In my opinion, in almost every case in which the cervix is not grossly diseased, the apparent obstruction to labor which the cervix presents is in reality a degree of cephalocervical disproportion which we do not appreciate. Therefore, the cases in which we resort to Dührssen's incisions do not represent situations in which Dr. Randall's conditions are absolutely fulfilled. In the absence of gross disease, it is my firm conviction that the cases apparently held back from successful delivery by failure of the cervix to dilate depend upon other factors, which Dr. Randall has so significantly covered in his statement of conditions, not due to the behavior of the cervix at all. I make this statement in the strongest possible terms because I do not want men who are definitely less able than Dr. Douglass, Dr. Randall, and the rest of us to estimate conditions accurately to be encouraged to resort to this type of operation.

DR. DOUGLASS (Closing).—I have no argument with Dr. Cosgrove about cervical dystocia. However, there seem to be a certain number of cases where there appears to be no disproportion, and yet the cervix does not dilate. It may be due to uterine inertia or some other abnormality, but in many of these cases a simple incision of the cervix allows completion of the delivery with little difficulty.

The high fetal mortality, of course, is not due in many cases to the operation itself, but to the prolonged labor which has necessitated the operation.

## VAGINAL AND RECTAL PRURITUS—ETIOLOGY AND TREATMENT\*

EDWARD L. CORNELL, M.D., F.A.C.S., CHICAGO, ILL.

IT IS my considered opinion that vaginal and rectal itching is one of the most neglected fields in medicine. Too many physicians pass over the complaint with ease and give some palliative prescription, or order the patient to take x-ray treatments or a douche. This attitude is deplorable. There is always a definite reason for the itching or burning, but it takes study on the part of the physician to discover the etiology. There is no definite rule to follow in all cases. There is no patient more grateful than the woman who is permanently relieved of this distressing symptom.

This paper is based solely on knowledge obtained in my private practice. I have found vaginal itching or burning due to the following causes, the frequency being in the order named: *Trichomonas vaginalis*, thrush, trichophyton infection, *Bacillus coli* and various bacterial infections. Rectal causes have been chiefly ameba, *Trichomonas*, the molds, and *Trichophyton*. Occasionally infected hemorrhoids or ulcers of the rectum may cause the burning sensation.

*Trichomonas vaginalis* has been by far the most frequent type seen. This infection has been described often in the literature. From the number of treatments recommended you are already familiar with the difficulty of eradicating the disease. My thought is that the physician should become familiar with one line of attack and follow it as a routine, changing management only as failure to cure appears in the individual patient.

My procedure is as follows: The patient is instructed to insert one Devegan tablet nightly on retiring and to report for office treatment the first, third, and fifth day of the period for four periods. At this time the vagina is cleansed of blood and three devegan tablets are inserted high in the vaginal vault. After the period the patient resumes the nightly use of the tablets. No douches are used.

In my opinion douches are worthless. The vagina practically cleans itself daily, and douches only clean a portion of the vagina. The average patient will not sterilize the douche outfit, and is more apt to reinfect herself than not. Furthermore, the water used is likely to infect the vagina with the *B. coli* unless it is boiled. Most patients will not take the time nor trouble to boil the water.

After the fourth period no tablets are inserted. The patient reports back in a week for vaginal secretion examination. If the secretions are negative she reports again in a week after the next period is over. If the secretions are negative again she is pronounced cured.

Her sexual partner must be examined by a urologist. It is difficult to discover *trichomonas* in the male, and often several examinations are necessary. During the treatment of the vagina sexual intercourse should be interdicted or permitted only with the use of the condom. If, after the sixth period, the

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patient becomes reinfected following sexual intercourse without the condom, the sexual partner must have *trichomonas* in his secretions, whether found under the microscope or not.

There are patients who do not respond to the above-outlined treatment. The physician should therefore be prepared to use some other form of attack. It is best to warn the patient that *Trichomonas vaginalis* is often difficult to cure. In some cases *Trichomonas* is associated with a large number of bacteria, so that a short course of sulfathiazole is indicated. On several occasions I have found a double infection present. Usually it is thrush, but I have also found the vagina full of *B. coli*. The thrush should be cleared up first and then the trichomonas.

In the pregnant woman the disease is very distressing and incurable. The patient can be made comfortable by the use of devegan tablets.

I have never seen a case of arsenic poisoning, even where the tablets were used over a long period of time. After the pregnancy is completed, the patient is placed on the routine treatment when the bloody discharge is gone.

In patients who have no periods 100 tablets are prescribed and one tablet is inserted daily. The patient is examined ten days after she stops treatment, and again in a month. If no *trichomonas* is found, she is pronounced cured.

If the infection is still present, a course of sulfonamides is given, and the devegan treatment is repeated.

Thrush is the next common cause of vaginal itching or burning. It is usually seen as a membranous type of discharge, the entire vagina being covered with a thick yellowish white membrane which may or may not be adherent. Sometimes it has the appearance of the clumps like those seen in cottage cheese. The vagina is reddened when cleansed of the membrane. The vaginal labia may be edematous and very tender to the touch. Microscopically *monilia* are present in profusion.

Fortunately, the treatment is short, effective, and usually lasting. Two drams of sodium borate are dissolved in about one ounce of glycerine and a tampon soaked with the solution is placed high in the vaginal vault. The tampon is removed by the patient just before returning to the office for another treatment. The treatments are given daily for four days. The patient returns in a week or ten days for a check-up.

Reinfection is seen rarely. The sexual partner can transmit the disease unless the penis is thoroughly washed with soap and water previous to coitus.

While reinfection rarely occurs, one patient returned three times in a period of two months with vaginal thrush. On close questioning the patient stated that her husband had had a skin lesion on his chest for some time. In cooperation with Dr. Cleveland S. White, the vaginal secretion was cultured and also the skin lesion. They were both caused by the *monilia*. As soon as the husband was cleared, there was no further trouble with the vaginal thrush. It is another demonstration that too much attention cannot be paid to essential details to clear up vaginal infections.

During pregnancy thrush does not respond readily to treatment. It is almost impossible to cure thrush during pregnancy. There are two ways of alleviating vaginal distress. Since tampons are apt to induce abortion in the susceptible patient they are not used. One method is to paint the entire vagina with a 3 to 5 per cent aqueous solution of gentian violet. This can be done once or twice a week for an indefinite period. The occasional patient is allergic to gentian violet and the vagina becomes fiery red, denuded in spots, and very tender.

Another method is to have vaginal suppositories prepared containing 10 grains of sodium borate in each suppository. One suppository is inserted in the

vagina nightly. This will relieve the symptoms promptly. During the last two weeks of pregnancy treatment is discontinued unless the itching is unbearable.

The nursery staff is cautioned to watch for thrush in the newborn baby. Curiously, oral thrush is seldom found in the offspring of mothers with vaginal thrush.

Many women wipe themselves forward toward the vagina after a bowel movement with the result that the vagina and urinary tract may become infected with the colon bacillus. Contaminated water used for douching may also be a source. The vaginal secretions then become yellowish, thin, have an odor, and are very irritating to the labia. These patients complain chiefly of vaginal burning, although some itching may be present. The vaginal wall is often reddened and angry looking. The patient complains of pain when the vaginal speculum is inserted.

The diagnosis is made by smear and culture. If the laboratory technician is well trained, it is often possible to make the diagnosis from the wet smear.

The treatment has been simplified since the introduction of sulfonamides. One gram of sulfathiazole given every six hours for thirteen to fifteen doses usually clears the infection promptly. I have found sulfathiazole more effective than other sulfonamides. The patient is instructed to return a week after the last dose of sulfathiazole when a culture is taken. If the result is negative, she is pronounced cured. If positive, the patient is given another course of treatment.

In the occasional patient who is allergic to sulfonamides, or one who does not respond to the course of sulfathiazole, streptomycin may be used. One gram in divided doses every three hours intramuscularly for three days will usually clear up the infection.

Other types of bacterial infection seen as a cause of vaginal burning or itching, are the *staphylococcus*, *streptococcus*, and the *gonococcus*. Pain is nearly always associated with this type of infection. In some the pain is very acute, so that the vaginal speculum should be used with gentleness. In the acute case the vagina is fiery red, often edematous, and the labia are swollen and reddened. The secretions are thin, watery, and very irritating.

The source of the infection except for the gonococeus is often difficult to determine. In general, it may be stated that the infection is due to unsterile douching equipment, failure of the male to wash the penis before sexual intercourse, using saliva as a vaginal lubricant and self-examining the vagina with dirty hands.

The diagnosis is made by smears, wet and stained, and by culture using special media.

The infection responds to the sulfonamides, except that the *gonococcus* responds best to penicillin. In some cases of *staphylococcus* both sulfathiazole and penicillin have to be used.

One patient seen shortly after the close of the war developed a severe *staphylococcus* infection within a week after her husband returned from the Pacific area. It was very resistant to treatment, requiring 3,000,000 units of penicillin to effect a cure. During the acute stage the pain was severe and a prominent symptom.

Regardless of the type of infection present after the acute stage has subsided, all possible sources of reinfection should be eliminated by cauterizing erosions, Nabothian cysts, Bartholin glands, and Skenes duets, and the urethra should receive careful attention. Fortunately, these do not give as much trouble as formerly, since the advent of penicillin and the sulfonamides.

I have seen only a few cases of vaginal infection due to the pneumococcus. The source of the infection is difficult to state, although I have the feeling it

may come from saliva used as a vaginal lubricant. The vagina has the same appearance as seen with the staphylococcus and streptococcus infections, but it is not so acutely inflamed. Fortunately, the response to sulfonamides is prompt. I have not had occasion to use penicillin.

Vaginitis is occasionally seen following the use of cauterizing drugs, such as strong solutions of silver nitrate, zinc sulfate, negatan, etc. When these drugs are discontinued the vagina clears up promptly as a rule. The vagina should be inspected frequently, however, so that the surfaces are not allowed to adhere to each other. If there is a tendency to adhere, a mild lubricating jelly may be injected daily.

Some patients are allergic to dyes such as gentian violet, brilliant green, etc. In these cases the vaginal surfaces become raw looking with more or less edema. The discharge may be profuse and it may produce a burning sensation. Soreness of varying degree is present. The injection of a mild lubricating jelly helps to relieve the pain and prevents the mucous membranes from adhering.

In women past the menopause, senile vaginitis often produces itching and/or burning. Formerly this distress was difficult to control. Now the use of estrogen by mouth usually clears the vagina in less than a month. Stilbestrol, in one mg. doses daily for a week or ten days with gradually decreasing doses will effect a cure unless there is a secondary infection with the *B. coli* or *staphylococcus*. In the latter case, sulfonamides should also be given.

The physician must rule out external causes for itching in and around the vagina. Leucoderma is not uncommon. One must distinguish this lesion from leucoplakia. In the former, itching is a prominent symptom. Also the skin and mucous membranes are cracked. These cracks are quite painful, and itching in and around them may be intense. The cracks are usually located in the folds and often extend down to the rectum. In long-standing cases the skin around the rectum may be involved.

The etiology in these cases is difficult to establish. It is my opinion that many are due to some form of mold, but I have been unable to get a growth from the lesion. I base my theory on the fact that most of these lesions have responded promptly to gentian violet applications. They have also responded to Grenz ray. Gentian violet, 5 per cent aqueous solution, is applied to the lesion and surrounding area two to three times a week for two to three weeks, and weekly thereafter until the lesion is healed. In most cases the whiteness of the skin gradually disappears. The patient should be warned that treatment may be prolonged.

In one case estrogen was used in addition to local treatment, and it seemed to help hasten recovery. Failures to cure result from inadequate treatment.

In cases not responding, a biopsy should be taken to rule out malignancy.

Another external source of vaginal and rectal itching is *trichophyton* infection. The usual source is athlete's foot disease in the patient herself or in some member of her family. I have found the *trichophyton* in the vaginal secretions in most of the patients with this type of lesion. In early cases there is a reddened, blotchy area on the labia majora varying in size from 1 cm. in diameter to a lesion 1 cm. by 3 or 4 centimeters. Cracks may or may not be present. The itching is often intense and constant. It is frequently worse during the menstrual period.

In long-standing or virulent infections the lesion may be extensive, affecting the inner aspect of the leg, the groin, the mons veneris, and posteriorly to the rectum.

Various types of medication have been used to cure the lesion. Gentian violet, 3 to 5 per cent aqueous solution, has been uniformly successful for me.

The vagina and all external lesions have been painted, usually two to three times a week, for one or two weeks, and then once a week until all lesions are gone. The feet must be cleared also because recurrence is likely to happen.

Lastly, burning and itching may be present due to lack of cleanliness. Smegma may be so profuse that the skin and mucous membrane become irritated. The lesion is seen chiefly around the area of the clitoris. Daily washing of the affected parts with soap and water is usually all that is necessary to effect a cure.

Rectal itching is a very distressing symptom, and the diagnosis of the cause is often baffling. In my private practice I have found the following etiologic factors.

When the itching is at the opening of the anus or just inside with little or no skin irritation the cause is some factor in the bowel, such as:

Ameba or other type of intestinal organism which may cause irritation with or without diarrhea. It is essential to have a cold and warm stool examined by an expert technician. It is noteworthy that these patients often have a musty straw odor which is very offensive. In the occasional case the skin around the rectum may be irritated.

Worms of various types are said to be the etiologic factor, but I have never seen a case.

The treatment of these patients is directed to clearing up the bowel by appropriate medication to remove the ameba, worms, etc., together with local treatment with gentian violet.

The second common source is a fungus growth. Here the skin around the anus is often thickened, whitish in color, and cracked usually radially from the anus. The diagnosis is readily made clinically by painting the area with 3 to 5 per cent aqueous solution of gentian violet. In a few hours the itching ceases or is markedly relieved. The dye has to be carried into the anus a short distance because the fungus infection often extends to the mucous membrane.

Occasionally it is necessary to use other medication if the patient is allergic to gentian violet. One per cent solution of brilliant green or two per cent mercurial ointment may be substituted.

Local itching or burning may result from uncleanliness, especially in obese women. The treatment is obvious.

I have seen two patients who developed marked itching and a rash from being allergic to lingerie such as rayon, celanese acetate, or nylon cloth, especially if dyed dark blue or black.

Many women have the habit of dusting the vagina and rectum with talcum powder following a bath. They use boxed powder and a puff. The puff and powder become contaminated with myriads of bacteria and molds and infection of the skin follows. Discontinuing the practice and appropriate treatment will clear up the itching and burning.

The most difficult cases to clear up are seen in senile patients. I have had two. In both the lesion involved the labia, the skin in the groins and the perineum and the rectum. In both it took several months to clear the lesion. Only weak (1 per cent) aqueous solution of gentian violet must be used, because the senile skin is very sensitive to medication. In these patients moderate doses of estrogens seem to help in relieving the intense itching, especially in the vaginal area. The x-ray should not be used, as it makes the skin more sensitive to the infection. Estrogenic ointment was efficacious in one patient.

Pediculosis, scabies, and diabetes must be ruled out in all cases.

I have never seen a case of active mycosis in the vagina.

### Discussion

DR. R. T. LA VAKE, Minneapolis, Minn.—This paper should be of great interest and importance to the general practitioner as well as to the specialist. It deals with conditions that can be accurately diagnosed and well handled by any painstaking physician possessing average laboratory equipment. Too often physicians underestimate the constant and extreme discomfort that these conditions entail.

Dr. Cornell brings out clearly two fundamental imperatives for success: a diagnosis by exclusion of the causes, be they systemic, due to skin diseases, or to organisms infesting the urinary, genital, or intestinal tracts; and the elimination of the male as a source of infection or reinfection.

His choice of therapy to meet varying conditions is excellent. To be emphasized is his enunciation that direct visual cleansing, followed by topical medication by direct vision, is superior to the douche. The douche does not cleanse or medicate the cervical canal which is an important harbinger of infection.

In my experience, the douche itself is often the sole cause of vaginal discharge and subsequent irritation. The idea of the douche makes a rational appeal to women, especially to fastidious women. It seems to them as plausible as any type of bathing. They do not sense the primary difference, which lies in the fact that the vaginal surfaces are not dried after the douche. They fail to consider that if the hands were immersed frequently and long in hot water, particularly if the water contained chemicals advertised or otherwise heralded as beneficial for "feminine hygiene" (some of which chemicals are even commonly known to be irritating to the skin), the hands would soon become abnormal and irritated, especially if they were not adequately dried after each immersion. I believe that the douche is unphysiological. It tends to macerate the epithelium, and the mechanics of the opposing wall rolls up masses of epithelium, denuding the vagina at times even down to the papillae. These masses of epithelium break down, emitting the disagreeable odor of decaying meat, which leads to the vicious circle of more frequent douching. The douche also disturbs the normal chemistry of the vagina, disturbs the balance of life of the normal protective flora, and tends to wash out the lubricating and protective mucus.

It requires but a short explanation to convince even an uneducated woman of the rationality of this viewpoint. However, she must be warned that it may take weeks without douches before the normal healthy condition of the vagina can re-establish itself. It often takes moral support and encouragement to rid a woman of this habit. This can best be achieved by regular inspections and appropriate treatment, with encouragement as to the returning normality of the appearance of the vagina, and the return of the normal flora.

It is obvious that conditions at times present where the benefits to be derived from the understanding use of a proper douche more than compensate for its obvious defects.

In the treatment of *trichomonas* infections, two chemical preparations stand out pre-eminently as cleanly and successful: devegan and floraquin. Each contains substances lethal to the organisms, and other substances that tend to render the vagina acid, which is essential, and supply the carbohydrate requirements of the normal protective flora. Some prefer floraquin as less toxic if by chance absorbed. Strangely enough, each of these compositions will at times fail and the other succeed. At times the acid constituent is inadequate and then vinegar douches or acid jellies may be used as a temporary adjunct.

DR. ADAM P. LEIGHTON, Portland, Maine.—Amateurish and silly attempts in the treatment of many symptoms are pathetic and criminal, as for instance in dysmenorrhea and in pruritus vulvae and pruritus ani. I have come to the conclusion that women in general get little sympathy when they present themselves for relief of these symptoms. Most of the time they get ineffective treatment.

When a woman comes to me, complaining of "itching" in "front" or "back," I make it a point to see to it that she gets attention and relief. No person in the world is more grateful. A woman is made wrongly anyway from an anatomic standpoint. She is handicapped from the start in keeping clean. She may have trichomonas, sugar, colon bacteria, leucoplakia, or alkaline urine among the many causes for her itching.

A woman usually urinates all over the vulva and perineum. She ineffectually tries to dry and clean herself with paper after voiding. I find that most of these cases of pruritus vulvae and pruritus ani are due to uncleanliness. Women do not use enough soap and water on their perineal region.

I have found that one of the chief offenders in these distressing symptoms is an excessively alkaline urine. This dries on the surface of the skin, and is rubbed and causes irritation by body motion and wet lingerie.

With a hyperalkaline urine, if you would restrict the ingestion of oranges, grapefruit, apples, pickles, and tomatoes, and give the woman about thirty or forty grains of ammonium benzoate a day, with a lot of water to drink, the results are surprising. It clears up the trigonitis, checks the polyuria and urinary frequency, and allays the alkalinity.

DR. WILLARD R. COOKE, Galveston, Texas.—I must take issue with one statement of the essayist that trichomonal vaginitis is difficult to cure. In about 1928 we adopted a modification of Gellhorn's suggestion, placing 1 c.c. of pure stovarsol powder in the posterior fornix every other day for six months; this to be followed after a lapse of three days by daily douches of 12.5 per cent solution of commercial vinegar in water (teacup full to one quart) for one month; twice daily during the bleeding phase of the menstrual cycle. In the first 1,100 cases in which this treatment was carried out there were six persistent recurrences. In each of these we later discovered, following a suggestion of Dr. Goodall, trichomoniasis of the endometrium and, in some instances, of the tubes. The uterus was removed from four of these patients subsequently for other indications, and in each case the vaginitis promptly responded to treatment. Without having tabulated, I would estimate that the same percentages would apply to subsequent cases.

In regard to the development of intolerance to gentian violet (I am not prepared to say whether this is an allergy) there is a very valuable warning signal which enables us to avoid giving an additional treatment after the intolerance has developed. This consists of a peculiar discoloration of the introital and vaginal mucosa which I can only describe as being between mauve and magenta. Further application of gentian violet after the appearance of this change in color will often precipitate a very painful and indolent superficial ulcerative process.

Parenthetically, and in defiance of the accepted theory of the action of succinol sulfathiazole, we have found that vaginitis due to *E. coli* responds well to the simple repeated use of this agent in dry form in the vagina. This has enabled us to relieve a number of cases of juvenile vaginitis in which no other pathologic organism than *E. coli* could be found.

DR. J. D. GUESS, Greenville, S. C.—I wish that this paper could be published in medical journals that are read by doctors generally throughout the country, because the general practitioners see more women suffering with itching of the vulva and anus than we do, and the general practitioner has no conception of the causes or of the cure.

I was particularly interested in Dr. Cornell's advocacy of the use of borax in the treatment of vaginal thrush. I have been using it for many years.

Dr. Cornell mentioned reinfection of the vagina with thrush. Women have a practice of rinsing out underwear and putting it on again the next morning. Simple washing will not kill the *monilia*, and this practice is a frequent source of reinfection.

One other point: In my experience the most frequent cause of perianal itching is uncleanliness, but not in the sense we ordinarily think of it. The passage of flatus, the accumulation of perspiration, slight seepage of moisture through the anus, excoriation in perianal skin folds occur even in women who bathe daily. The area is unclean in the strictest sense of the word. In many cases there is no other cause of itching than this moisture of the skin with slight soiling. A treatment affording temporary relief and often a cure is to massage the area with rubbing alcohol. This may be repeated at will and should be done night and morning. The alcohol is cleansing and drying. It is mildly bactericidal and it has a local anesthetic action. The patient should be warned that the alcohol will burn her for a moment.

DR. W. F. T. HAULTAIN, Edinburgh, Scotland.—This is a subject which has interested me very much for a number of years, and it would seem that our methods of treatment in Great Britain are perhaps a little different from yours. Devegan does not seem to cure by any means all cases of *Trichomoniasis vaginalis*. In Britain we see only those cases referred to us by general practitioners, and usually they have already tried devegan or some other treatment and have failed to cure the condition. Thus we have to treat the condition more intensively. I have frequently used stovarsol, which Dr. Cooke mentioned, but I think it is important that it should be given first of all as a powder insufflation, probably best given during the menstrual period, as it has been shown by Swift in Adelaide that the *trichomonas* is smallest and most active at the menstrual period, and if they are killed off then before they grow up to any size, you will have the best chance of curing the condition. Therefore, these patients are treated by dry swabbing and insufflation with stovarsol during the menstrual period, and in the interval they insert a stovarsol suppository nightly. The majority of cases clear up by such treatment.

With regard to leucoplakia, that is an important condition insofar as it is very often a precursor of malignancy; therefore, we teach that leucoplakia must not be treated conservatively for too long. If conservative treatment does not begin to cure the patient within two or three weeks, a biopsy has to be taken. In my charge during the last ten or fifteen years every patient with marked leucoplakia has had the stomach contents examined in an effort to find whether free hydrochloric acid is present or not. In about 30 per cent of the cases there was no free hydrochloric acid present in the stomach. If these patients are treated with hydrochloric acid dilute 30 minims thrice daily the leucoplakia will quickly clear up. The pioneer work on this subject was again done by Swift of Adelaide, who considered that in these cases leucoplakia was due to an avitaminosis due to the nonabsorption of vitamins A and D, and these could be added as adjuncts to the treatment.

One last comment regarding senile vaginitis. I would not consider the dosage of stilbestrol advocated by Dr. Cornell to be strong enough to obtain a speedy result. I have always given 5.0 mg. of stilbestrol twice daily for fourteen days, and on the fourth day onward have supplemented this by Kolpon pessaries (oestrone and glucose). In my experience there are very few, if any, cases of uncomplicated senile vaginitis, which do not clear up in fourteen days with this treatment.

DR. CORNELL (Closing).—I stated that I felt each physician in treating *trichomonas* should learn one individual technique and learn it thoroughly. To try first one thing and then another is a mistake. You do not get familiar with the management, the results, and the appearance of the vagina after a mixture of treatments. If you do not succeed in curing the patient with one particular method you have selected, after a sufficiently long time, then try another and become thoroughly familiar with it. I just want to caution in the use of fluoroquin in the cases that do not respond to stovarsol. Muscular pains often follow the use of fluoroquin if the patient is allergic to that particular drug.

Regarding the dosage of stilbestrol, the amount I usually start with is one milligram, and, while I do not get results as promptly as Dr. Haultain did, the results over a longer period of time are apparently equally satisfactory. I feel that in the older women we should be a little more careful of overdosing. It is easier to underdose and have the patient comfortable than to overdose and produce lower abdominal pain and other symptoms that go with overdosing of estrogens.

## HISTOLOGIC APPEARANCE OF COILED ARTERIOLES IN THE ENDOMETRIUM OF RHESUS MONKEY, BABOON, CHIMPANZEE, AND GIBBON\*

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THE coiled arterioles of the endometrium of the rhesus monkey undergo a series of characteristic alterations during the menstrual cycle, and play a major role in the control of the amount of hemorrhage and necrosis during menstruation. In this study these vessels are described and illustrated as they appear in routine histologic material. The loops made by the arteriole as it passes repeatedly through the plane of the section produce the arteriolar field. At the time of ovulation, the fields are in the deep third of the endometrium, and the loops are 6 to 8 in number, while the arteriolar wall is thin. In the progestational phase the loops increase in number, the fields become more superficial, and the vessel walls widen and acquire a swollen appearance. At the onset of ovulatory menstruation, there are twenty or more loops in the field which is now in the superficial half of the endometrium. These changes recede after the onset of menstruation, and the postmenstrual vessel is simple and thin walled. In anovulatory menstruation, the fields are in the deep half of the endometrium, and include about twelve to fifteen loops of relatively thin walled vessels. There is, therefore, a striking difference between the coiled arterioles of ovulatory and of anovulatory menstruation.

Coiled arterioles are found in the endometrium of the baboon, chimpanzee, and gibbon. It is possible that menstruation in the gibbon involves less hemorrhage and necrosis than in the rhesus monkey, and that the arterioles do not undergo as marked a progestational change, but there is insufficient material on which to base a definitive statement.

The concept that menstruation occurs because of ischemia produced by complexity of the coiled arterioles is untenable in view of these observations. Further studies of menstruation in other primates, emphasizing their differences from man, can be expected to clarify many of the unsatisfactorily explained features of the menstrual process.

\*This article is an abstract of the Foundation Prize Thesis for 1947 of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons. It was read at the Annual Meeting, Hot Springs, Va., on Sept. 4, 1947, and has appeared in full in *The Anatomical Record*, 99: 199, 1947.

## IGNAZ PHILIPP SEMMELWEIS\*

PALMER FINDLEY, M.D., F.A.C.S., OMAHA, NEB.

IT HAS been said that we see far when we stand on the shoulders of our predecessors. This is but another way of saying that if we are to understand the problems of today we must know the happenings of the yesteryears—we must know history.

Carlyle tells us that history is the essence of innumerable biographies. May I offer you a biographical sketch of one of the most tragic characters in the history of medicine; a man who sacrificed his happiness, his reason and his life for an idea.

From the beginning of time stark tragedies have stalked the road to progress. In every age since history was written there have been men of vision who have evolved new ideas, new truths that have run counter to traditional beliefs and practices. Such men have too often been the targets of controversy and strife, and nowhere is this more in evidence than in the transition from primitive to modern obstetrics.

Galen, whose contributions to obstetrics were not impressive, was fiercely assailed by his colleagues, and against his adversaries he defended his theories with a vigor and acrimony that has seldom been equalled. Impatiently he turned to the laity "who," he said, "at least had common sense, which was wanting in the sophist physicians." "These opponents," said he, "differed from bandits only that the doctors practiced in Rome and the bandits in the forests."

Andreas Vesalius of Brussels was first to demonstrate that the uterus, formerly regarded as bilocular or multilocular, is, in reality, a single chamber. He literally robbed the gibbet and the grave in dissecting the body of a pregnant woman who had been condemned to the gallows. His dissections brought upon him the wrath of the clergy who contended that the body of man is the temple of the Soul and to invade it with the dissecting knife is sacrilege.

Vesalius abandoned the dissecting room and burned his manuscript. His *De Frabica Humani Corpus* revolutionized the study of human anatomy, but was not accepted by the medical profession until long after his death.

Leonardo da Vinci, artist and anatomist of the fifteenth century, depicted for the first time the normal attitude of the fetus in utero. Drawn with the utmost fidelity to scientific accuracy and artistic beauty, his drawings were in marked contrast to the ludicrous positions which appeared in the *Rosengarten*. For his dissections he, too, was roundly denounced by the clergy.

It was in this period of scientific awakening that modern obstetrics had its birth; when the untutored midwife, the priest-physician, and the barber sur-

\*An address commemorating the Anniversary of the publication of the treatise by Semmelweis on puerperal fever, presented before The American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Hot Springs, Va., Sept. 5, 1947.

geon gave way to men trained in the art of delivery. In their hands superstition, ignorance, and religious bigotry were the common clay out of which modern obstetrics was moulded.

William Harvey, called by Aveling the Father of British Midwifery in appreciation of his chapter on "Labour," was regarded by his envious colleagues as a crack brain. "They would not give a three-pence for his pills." After publishing his immortal work on the circulation of the blood, Harvey is quoted as saying: "I not only fear injury to myself from the envy of the few, but I tremble lest I have mankind as my enemy." The calumny heaped upon Harvey caused his practice to fall off and we find him loathe to publish his classic work, *Generation of Animals*, recalling the contentious reception of his immortal work on the circulation of the blood. "Much better," said he, "is it often times to grow wise at home and in private than by publishing what you have amassed with infinite pains to stir up unrest that may rob you of peace and quiet for the rest of your days." Harvey's most violent adversaries proved that eternal opposition could procure a certain kind of immortality.

For five generations the Chamberlain family was discredited and viciously attacked by the medical profession for withholding the secret of the "iron tongs." While deplored their secretiveness, it is only fair, as Aveling has said, to bear in mind that the Chamberlains lived at a time when it was common practice to withhold secrets of healing nostrums, when doctors in high repute extolled the virtues of mysterious healing potions.

Dr. John Burton, famed in *Tristam Shandy* for his forceps, defied his critics with seething sarcasm. In defiance of his adversaries he writes: "But for those people who like Birds of Night scream in the dark, when none can see them; and like cowardly enemies, unseen shoot their envenomed darts at me in secret whispers or anonymous papers, such creatures may split their malignant choler, till it consumes themselves, before I shall regard them in the least."

William Smellie had the indomitable Mrs. Nihell to contend with. Mrs. Nihell, of the hay market, was the doughty and uncompromising champion of a lost cause. Defending the midwife in her divine right to monopolize the practice of midwifery to the exclusion of the man midwife, Mrs. Nihell chose Smellie as her target whose forceps were "not so delicate as a woman's hands." If Smellie, "Master of British Midwifery," could be discredited, his murderous instrument would pass with him. Smellie suffered the usual hardships of a pioneer and crusader. In combatting the superstitions and vicious practices of the midwives of his time, he was subjected to the scurrilous attacks of those whose methods he condemned; attacks that did not end with the death of Smellie, but continued on for one hundred years.

In the sixteenth century Dr. Veitis of Hamburg, Germany, was condemned to the flames for attending a woman in labor; while in our own land, as late as 1754, Dr. James Lloyd of Boston was roundly denounced for immorality and licentiousness in a similar performance of his professional duties. But the calumny heaped upon him was as nothing compared to that meted out to James P. White as an aftermath of an obstetric clinic held at the University of Buffalo, New York, in 1850.

White was charged with the commission of acts of outrage against the rights of the community, against decency and propriety. He was libeled by the press and bitterly assailed by members of the medical profession. At the trial which followed it was contended that the exposure of the body of a parturient woman was wholly unnecessary to the successful conduct of the delivery; that to so expose a parturient woman to the vulgar gaze of the public is a "shock to the moral sensibility, diminishes the moral feeling, and debases the moral man." The vindication that ultimately came to Dr. White resulted in the establishment of the first obstetric teaching clinic in America.

Ephram McDowell, our American frontier surgeon of Danville, Kentucky, performed thirteen ovariotomies with eight recoveries at a time when anesthesia and antiseptics were unknown. His report of the first three operations appeared in 1817 and brought forth a storm of ridicule and skepticism. The veracity of McDowell was questioned by James Johnson, editor of the London Medico-Chirurgical Review, while others referred to the operation as brutal butchery and cruel. McDowell did not live to enjoy the fruits of his labors, a fate shared by many a benefactor of the human race. It was more than a century after his death that the profession fully realized that "pelvic and abdominal surgery began with ovariotomy, and ovariotomy began with Ephram McDowell, the backwood's surgeon."

William Hunter became the target of an outraged public opinion because of his anatomic dissections, as did William Shippen, Jr., America's pioneer anatomist and obstetrician. Shippen was berated and threatened with violence for exposing women in labor to the vulgar gaze of the midwives and doctors.

Sir James Y. Simpson was vigorously attacked by the medical profession that held to the age-old dictum that pain in labor is salutary and a conservative manifestation of life. He was excoriated by the clergy for defying the Almighty, for was not the pain of childbirth an ordinance of Divine Providence? Simpson will be remembered for his heroic efforts in overcoming all opposition to the relief of pain in childbirth. Let those who would pass ill-advised judgment upon the deeds of others mind the words of the discrete Simpson: "Obstetrics," said he, "is not one of the exact sciences, and in our penury of truth we ought to be accurate in our statements, generous in our doubts, tolerant in our convictions. Without these qualities science cannot be promoted nor truth educated." Patience, tact and perseverance were the secrets of Simpson's success. The contributions of Simpson and Semmelweis to obstetrics and surgery were made but a few weeks apart in the year 1847.

In the history of midwifery there is a dark page and it is headed *Semmelweis*. So wrote Fritsch of Breslau. The page is dark because no man in the annals of medicine contributed more to the saving of lives and suffered more grievously at the hands of carping contemporaries. Semmelweis refused to be chained to the dogmas of a dead past, to the vagaries and the pedantry of the obstetricians of his time, and for his pains he was driven to the mad house. But with all this he has left a priceless heritage, and deserves well to be remembered on this, the one hundredth anniversary of his contribution to obstetrics.

"He was one of those mortals who was not always happy," wrote Marku-sorsky, "but he was favored by fate, inasmuch as it was given to him to enrich science with a new idea and thereby to confer upon humanity an immeasurably important service."

The name Semmelweis will ever be associated with that of puerperal sepsis, for it is to him, more than to any other individual, that credit is due for being the first to demonstrate through clinical and anatomic observations the etiology and the prophylaxis of the malady. The disease was not unknown to the earliest writers on medicine, to Hippocrates, Celsus, Avicenna, Pater, Sylvius, and Willis, but no mention was made by these authors of epidemics, nor does it appear that they were impressed with the seriousness of the malady.

The earliest reference to epidemic puerperal fever was made by M. Peu of Paris in 1646. He wrote of an epidemic that occurred in the Hotel Dieu of Paris in 1646 when scarcely a woman survived the disease. Later Pinard referred to an epidemic in the same institution in 1778 that took of lives of seven of twelve parturient women. Staff members counseled over what they called "the bothersome epidemic," and out of their deliberations and their findings at the postmortem table the milk theory was evolved. From then on milk was banned from the hospital—but the epidemic swept on.

There were other theories evolved as epidemics swept through maternity wards in Dublin, Edinburgh, London, Vienna, Prague, Paris, and indeed throughout all continental Europe and Britain. There were the theories of overcrowding, of foul air, of errors in diet, of emotional influences, of gastric bilious fever, of inflammation of the pelvic organs and peritoneum, of miasma of the blood, of genus epidemicus, of lochial suppression, and atmospheric, telluric, cosmic influences. All these and more were the theories advanced by men eminent in the field of obstetrics as late as the middle of the nineteenth century. Out of all this hodge-podge and welter of theory and conjecture there was finally evolved a reasonable and tangible hypothesis that led to effective measures of prevention—this was the contributions of Charles White, Alexander Gordon, Oliver Wendell Holmes, and Semmelweis. They were the men who "traveled along unknown paths that later became open thoroughfares."

Charles White of Manchester, England, almost a century before the time of Semmelweis, argued that childbed fever was a process of self-poisoning due to the absorption of the pent-up lochial secretions. As preventive measures he introduced the sitting posture to facilitate drainage, lime disinfection of the hands, clean linens, isolation of infected cases, and adequate ventilation of the wards of the Manchester Infirmary. And he boasted that under these restrictions not a death from puerperal sepsis occurred in his clinic.

That White anticipated antisepsis long before the time of Lister is evidenced by the following quotation from his *Treatise on the Management of Pregnant and Lying-in Women* (London, 1772): "I must not omit to mention in this place," said he, "the good effects I have experienced from emollient or antiseptic injections into the uterus, by means of a large ivory syringe, or an elastic vegetable bottle—I have, by this means, known the fever much assuaged,

and, in many cases, wholly extinguished." White was first to recognize the entity of "milk leg"—later known as phlemasia albadolens.

Thomas Kirkland succeeded White in the Manchester Infirmary and made similar claims, as did Robert Collins in the Dublin Rotunda. So much from the British point of view on the mooted question of priority.

Why, then, we ask, did White fail to receive more generous recognition for his contribution to the solution of this vexed problem. The answer, in part, seems to be in the facts that White, unlike Semmelweis, lived in comparative obscurity far removed from the cross roads of medical progress. But more than all he did not possess the zeal of an evangelist—willing, if need be, to suffer martyrdom for a cause.

Closely following upon White came Alexander Gordon of Aberdeen, who in 1795 published *A Treatise on the Epidemic Puerperal Fever of Aberdeen* in which, for the first time, puerperal fever was proclaimed a contagion. Gordon's contribution was little noted on the Continent, so he escaped the defamation and the cynicism of his contemporaries in Europe; a misfortune that Semmelweis could not escape.

As Physician and Surgeon to the Infirmary of Aberdeen Gordon was in the thick of an epidemic of puerperal sepsis in the years 1790 to 1792. Twenty-eight of the seventy-seven patients died. Noting that these cases followed in the wake of certain doctors and midwives, he reasoned that some sort of contagion was carried from patient to patient by the attendants. Reasoning from clinical and postmortem observations, he arrived at the conviction that the disease was infectious. He counseled personal cleanliness on the part of the doctors and midwives and the fumigation of clothing and linens. It is to him that credit is due for being first to call attention to the contamination of wounds at the placental site—that puerperal fever is a wound contamination of the puerperal uterus.

"That the cause of this disease was a specific contagion or infection," said Gordon, "I have unquestionable proof—I had evident proofs of its infectious nature, and that the infection was as readily communicated as that of small pox or measles—I had evident proofs that every person who had been with a patient in the puerperal ward became charged with an atmosphere of infection, which was communicated to every pregnant woman who happened to come within its sphere. . . . These facts fully prove that the cause of the puerperal fever—was a special contagion or infection altogether unconnected with a noxious state of the atmosphere. Fresh air and cleanliness are insufficient for the destruction of contagion. There is no certain antidote but fire and smoke."

Gordon's influence with the populace was undermined by his insistence upon heroic purging and blood letting. He contended that he could abort the disease by such means if applied in full measure at the onset of the fever. "Hit hard and hit early," was his maxim. He contended that fumigation of the clothing and bedding and the washing of the hands of attendants were imperative, but, above all, the patient must be purged and bled to the limit of her endurance. Be it said to his credit he did abandon blood letting at the insistence of the populace, but continued on with the purging.

In our own country Oliver Wendell Holmes published a damning indictment against the medical profession in *The New England Quarterly Journal of Medicine and Surgery*. This was in April, 1843, four years before Semmelweis published his historic treatise on *The Cause, Concept and Prophylaxis of Puerperal Fever*.

Holmes' allegations were not based upon anatomie and clinical observations. He had little or no obstetric experience to back his assertions. His pronouncements were founded upon information that had come to him through personal correspondence and library research. Acting the role of a barrister pleading the cause of martyred mothers, the genial autocrat of the breakfast table declared: "The balance must be struck boldly and the results declared plainly. If I have been hasty, presumptuous, ill-informed, illogical; if my array of facts means nothing; if there is no reason for any caution in the view of these facts, let me be told so on such authority that I must believe it, and I will be silent henceforth, recognizing that my mind is in a state of disorganization. There is no quarrel here between men, but there is deadly incompatibility and exterminating warfare between doctrines. Let the men who hold opinions look to it, if there is any voluntary blindness, any interested oversight, any culpable negligence, even in such a matter, and the facts shall reach the public ear, the pestilence carrier of the lying-in chamber must look to God for pardon, for man will never forgive him."

The inimitable Holmes, academic physician and master rhetorician, gained undying fame here in the United States for his personal charm and matchless phrasing. But personality and faultless diction are no substitute for scientific research at the dissecting table and at the bedside. Holmes said puerperal sepsis could be prevented; Semmelweis proved that it could be.

Sir William Sinclair has this to say of the contribution of Holmes: "Here is the sum of the services of O. W. Holmes to obstetric science; as a science, it is a negligible quantity. But that Holmes conferred immense benefits on humanity by devoting his literary genius to attracting attention to puerperal fever and trying to suppress the practices which brought childbed fever in their train, is a fact which should be gratefully acknowledged.

But how, in the name of truth, does all this bring him into any sort of conflict or even comparison with Semmelweis? Still it brought down upon him the most trueulent attacks from obstructionists in the highest official positions. Hodge, Professor of Obstetrics in the University of Pennsylvania, attacked Holmes with a certain amount of dignity not unworthy of the subject, but Meigs, Professor of Midwifery in Jefferson Medical College of Philadelphia, assumed the old aboriginal American style of warfare, and attacked him with a tomahawk and scalping knife of the Red Indian savage. He astutely hit the taste of his fellow countrymen, their gambling propensities, and their religious sentiments by attributing puerperal fever to 'chance or Providence.' "

While Holmes was making his passionate plea, Semmelweis was in the Allgemeines Krankenhaus in Vienna, battling with the scourge of puerperal sepsis, and all the while exerting all possible means of checking its ravages.

Ignaz Philipp Semmelweis was born in July, 1818, in the village of Ofen, a suburb of Budapest. He was the fourth of eight children; his father was a

shopkeeper. His early training was deficient, and all his life he was regarded by his critics as illiterate. After finishing grammar school in Ofen he enrolled in the University of Pest, and two years later he entered the Vienna School of Medicine where he remained one year and then returned for two more years to the University of Pest. His final year in medical school was spent in Vienna where he received his degree of Doctor of Medicine in April, 1844. In the following August he was granted the degree of Doctor of Midwifery.

July, 1846, found him in the First Lying-In Clinic of the Allgemeines Krankenhaus as First Assistant under Professor Klein. Referring to his first impression of the clinic Semmelweis said: "Everywhere questions arose, everything remained without explanation; all was doubt and difficulty. Only the great numbers of deaths was undoubted reality." It was here that he laid the foundation for the work that was to immortalize his name.

His daily routine consisted of caring for the patients in the ward and the instruction of students. In the early morning it was his habit to participate in autopsies, particularly on the bodies of women who had died of puerperal fever. The students also participated in the dissections; and, all the while, in the wards, in the dead house, and throughout sleepless nights, Semmelweis pondered over the tragedies enacted within his ward: "What is this fever?" "What is taking the lives of so many of my patients?" "How can it be prevented?" "How does it arise?" "What treatment can avail to halt the appalling death rate?" "Surely there must be something in the First Clinic that does not exist in the Second Clinic to account for the great discrepancy in the two wards. May it be that I and my students are the carriers of the contagion?"

While Semmelweis was brooding over his problem, an event occurred that ultimately gave to him the answer to the questions that had so long defied solution. Kolletschka, Assistant in Anatomy, received a stab wound in his finger while dissecting. Death resulted from the infection. Semmelweis witnessed the autopsy and saw the identical lesions which he had so often observed in the bodies of the women who had died in his ward of puerperal fever. He reasoned that Kolletschka had died of a wound contamination; that the contaminating substance was decomposed animal organic matter.

"Day and night, this picture of Kolletschka's disease pursued me," wrote Semmelweis in his Etiology, "and I was obliged to acknowledge the identity of the disease from which Kolletschka died with the disease of which I saw so many puerpera die. It was not the wound, but the contamination of the wound by cadaveric material that caused the death." It was this same substance that was being carried to his patients from the dead house to the lying-in ward—it was being carried there by himself and his students. "God only knows," said he, "how many women I have prematurely brought down into the grave!"

Determined to put an end to the scourge that was ravishing his ward, he gave orders that no students attending his ward could, at the same time, be in attendance on postmortem examinations; that before making examinations in his ward, the students must scrub their hands in a solution of chloride of lime.

Then the miracle happened. Within seven months the mortality from puerperal sepsis dropped from 11.4 per cent to 1.27 per cent. For the first time in

the history of the hospital the mortality was lower in the First Clinic than in the Second Clinic where only midwives were in attendance. In March and August of 1848 there was not a single death in the First Clinic.

The problem was solved to the satisfaction of Semmelweis, but it was quite another thing to convince his Chief and his colleagues and to have his Doctrine approved by the medical profession. This was the task he set himself to but, unhappily, it proved to be his undoing. Petty jealousies, stupidity, and willful blindness were to hinder his every effort. With few exceptions the obstetricians on the Continent, in Britain, and in the United States were committed to theories of their own, and would have nothing to do with the newfangled notions of the Hungarian Assistant.

Semmelweis had weighed their theories in the balance and found one and all wanting. He reasoned that atmospheric changes, overcrowding, faulty ventilation, and diet were not the answer, for these factors were identical in both the First and Second Clinics. Puerperal fever was not an epidemic, zymotic disease, like cholera and erysipelas, for such diseases show year-long intermissions, while puerperal fever is more or less constant. Inflammation of the pelvic organs and the peritoneum was not the cause, but rather the result of the contagion. And as for the milk theory, he did not trouble to affirm or deny.

Among his detractors was his Chief, Professor Klein, who, far from offering encouragement and counsel, had placed every possible obstacle in his path, and finally demoted Semmelweis to the rank of Private Docent of Theoretic Midwifery, restricting his teaching to manikin demonstrations. No longer could he have access to the beds in his clinic.

Grieved and inconsolable, Semmelweis left Vienna without serving notice and returned to his beloved Budapest. But Budapest was not the city he had left in such high hopes to pursue the study of medicine. Hungary was in a state of revolution and, as with all things in Hungary, the medical profession, the University, and the St. Rochus Hospital were in a state of disorganization. Obstetric cases were admitted to the hospital only two months in the year. In the remaining months surgical cases occupied the lying-in ward. The surgeon-in-charge was also the coroner, and engaged in autopsies. Puerperal fever had, for years, been running rife in the hospital. In some months the mortality ran as high as 30 per cent. Semmelweis asked permission to take over the direction of the Lying-In Clinic in order that he might put an end to the scourge. And in May, 1851, he was placed in charge of the Obstetric Division of St. Rochus Hospital.

His first step was to sever all connection with the surgical department. The rules and regulations which he inaugurated in the Vienna Clinic were put in force and, as a result, the mortality from puerperal fever in his ward in the following five years fell to 0.85 per cent—an all-time low.

As Chief of the Lying-in Division of the St. Rochus Hospital, Professor Birly, like Professor Klein, in Vienna, would have nothing to do with the crazy notions of Semmelweis. Birly was a disciple of the *prima viae* theory and advocated the use of strong purgatives in the treatment of septic cases. To his

credit, Semmelweis made no issue with his Chief while quietly pursuing his course, trusting that in time his Doctrine would be accepted on its own merits.

Professor Birly died in 1855, and Semmelweis succeeded him as Professor of Theoretical and Practical Midwifery in the University of Pest. With the appointment came a rejuvenation of Semmelweis. Now, for the first time, he was his own master and was enjoying a measure of fame and the reward of a modest income from private practice.

But there were many handicaps and discouragements. The wards were too small to accommodate more than two hundred patients a year, yet it was always over crowded and there was no provision for the isolation of infected cases. For the lack of an amphitheater, students received instructions while standing in the corridor. The hospital staff was unfriendly and disloyal. Regarding their Chief as a faddist and a crackpot, they were unwilling to carry out the preventive measures so essential to the success of the clinic. Yet, with all these handicaps, the mortality from puerperal sepsis in the years 1850 to 1856 remained at 0.85 per cent—an unheard of record for St. Rochus Hospital.

To this time Semmelweis had not appeared in print in support of his *Doctrine*. As a result there was much misunderstanding and conjecture as to the essential principles he was advocating. His friends were insistent that he resort to the printed word to put at rest the bickering and the willful misrepresentations that sprang from sources that could not be ignored.

Semmelweis finally yielded to the demands of his friends, and with resolute determination he set to the task of writing his *Etiology*. "My *Doctrine*," said he, "is either ignored or offensively assailed—indignation at the greatness of this scandal has thrust the pen into my unwilling hand; I think it would be criminal behavior on my part if I were longer to remain silent and neglect producing unbiased, impartial, and complete evidence in favor of the practical extention of my *Doctrine*."

For three years Semmelweis worked feverishly on his manuscript and in October, 1860, it was ready for the press. We, of our time, regard the work one of the epic-making contributions to medical literature. Not because of its literary qualities—for in this respect it was woefully lacking—but because of the fundamental principles laid down that have formed the basis for preventive medicine in the fields of obstetrics and surgery.

Much of the text was hurriedly assembled without regard for sequence and symmetry, thus leading to confusion. An endless array of statistics was incorporated in the text that few would care to wade through. Then, too, much of the text was devoted to acrimonious correspondence with the leading obstetricians of Europe. These letters were full of charges and countercharges, of censure and reflection, and to an extent that defeated the very purpose of his writing—that of winning converts to his *Doctrine*. The chapters devoted to "Etiology" and to "Prophylaxis" were brief and excellent. Had Semmelweis been content with these two chapters, leaving out much of the statistical material and all of the challenging correspondence, his work would have had a more favorable reception. But, being what it was, it was not well received. On the contrary, it only served to add fuel to the flame.

Enraged over the unfavorable reception of his *Etiology*, Semmelweis set to the task of writing *Open Letters to Sundry Professors of Obstetrics*. He would make one more effort to indoctrinate his traducers in what he believed to be the only true nature of puerperal fever. "I shall do my utmost," said he, "to insure the cessation of murder, for anyone who dares disseminate the dangerous fallacies concerning puerperal fever will find in me an extremely active opponent. I am firmly convinced that there is no other way of putting a stop to those murders than the ruthless exposure of my adversaries, and no one whose heart is in the right place will blame me for the means I use."

From that moment to the day of his death Semmelweis engaged in an unremitting verbal combat with his critics, but the more he fanned the flame of calumny, the more he became involved in controversy.

"The controversy," said Waldheim, "became no longer a scientific encounter, no struggle to attain to a knowledge of the truth, but a thoroughly personal, hateful wrangling under the semblance of scientific discussion."

Wounded pride and deep resentment led Semmelweis into criminations and personalities that served to alienate rather than to placate his opponents. Karl Schroeder regarded the Semmelweis Doctrine as one-sided and inadequate, and Max Boeler referred to the Open Letters, which Semmelweis addressed to sundry Professors, as extremely vehement and threatening. Josef Spaeth, while professing his conversion to the Semmelweis "Doctrine," expressed the opinion that his theory would have gained more obstetricians as open friends if he had not defended his theory in a tone which no man of science had been accustomed to up to this time. Carl Braun, Vischow, Zipfel, Siebold, Veit, Hecker, Scanzoni, and Denman were among his critics. Kiwisch, of Wurzburg, would not be convinced, though in the year 1846 the mortality from puerperal fever in his ward was 26 per cent. Denman, of the Dublin Rotunda, said it would be a waste of time to dwell upon his Lehre. On the other hand Haller, Skoda, and Rokitansky of Vienna; Michaelis and Swartz of Kiel; Wieger, of Strassburg; Kassmaul of Heidelberg, and Tilanus of Amsterdam, were among his supporters. Hebra rated the contribution of Semmelweis as comparable to that of Jenner. But even these men of high authority could not stem the tide of criticism. Hebra published a commendatory article in the *Journal of the Medical Society of Vienna* that was roundly criticized, and Skoda failed in having the Doctrine of Semmelweis investigated by the same society. Weigner, of Strassburg, endeavored to interest the French accoucheurs and failed, as did Arneth before the London Academy of Medicine. Everywhere Semmelweis was to feel the sting of professional intolerance.

Exasperated by the opposition, Semmelweis declared: "I have resolved to attack unsparingly all who dare to spread error regarding puerperal fever." To Professor Spaeth he wrote: "The Professor has given me the impression that his spirit has not been lighted up by the puerperal sun which arose in Vienna in 1847." And to Scanzoni of Wurzburg, then the leading obstetrician of Europe, Semmelweis wrote: "You have sent over all Germany a considerable contingent of practitioners who will, in their ignorance, engage in homicidal practice. I have formed an unshakable resolution to put an end to the mur-

derous work as far as lies in my power to do—I denounce you before God and the world as a murderer, and the history of puerperal fever will not do you an injustice when for the service of having been the first to oppose my teachings, it perpetuates your name as a medical Nero." Such vitriolic expressions could hardly serve their intended purpose, that of winning converts to his "Doctrine."

There came a time when the sensitive, impetuous nature of Semmelweis was unequal to the strain of violent controversy. In the early part of 1863 he began to have alternate attacks of excitability and melancholia; his memory failed him and his mind became clouded. He lost his professorship at St. Rochus, and in August, 1865, he was taken by his faithful friend, Professor Hebra, to an insane asylum in Vienna. There he died of a septic infection August 13, 1865, at the age of 47 years. The autopsy revealed a gangrenous wound in the finger of his right hand acquired in a surgical operation, lymphangitis in the right arm, metastasis in the eye, pyopneumothorax, and an extensive brain lesion. He died, as did his friend Kolletschka, of the very disease he himself had sacrificed his life to conquer. May it not have been said of him as it was said of the Man of Galilee: "He saved others—Himself he cannot save."

Appended to his Etiology, Semmelweis had written: "When I, with my present convictions, look back upon the past, I can only dispel the sadness which falls upon me by gazing into the happy future when within the lying-in hospitals, and also outside of them, throughout the whole world, only cases of self-infection will occur. But if it is not vouchsafed for me to look upon that happy time with my own eyes, from which misfortune my God preserve me, the conviction that such a time must inevitably sooner or later arrive will cheer my dying hour."

Puerperal sepsis has not been wholly banished from the world as Semmelweis prophesied, but the principles laid down by him for its prevention have gone far in lessening the incidence of the malady. Semmelweis bequeathed to the modern maternity its supreme virtue—that of cleanliness. Furthermore, subsequent events have not altered the basic principles laid down by him on which the Doctrine of Semmelweis was founded. The contributions of Pasteur and Lister elucidated and confirmed his Doctrine.

His temporary burial was in Vienna, but later he was laid to rest in his native city of Budapest. In the garden of the Allegmeines Krankenhaus in Vienna is a marble slab erected to the memory of the most tragic figure in the history of medicine. And on the slab is a beautiful bronze tablet bearing the name *Semmelweis*.

In 1906 an international monument was erected in memory of the man to whom the world is indebted for his priceless contribution to humanity. There Semmelweis stands in full stature, holding a book under his arm and on the step of the pedestal sits a woman with her infant in her arms, her face upturned, gazing reverently at her benefactor.

The American Association of Obstetricians, Gynecologists, and Abdominal Surgeons revere the name of Semmelweis and unite with all obstetricians the world over in paying tribute to him on this the one hundredth year of his doctrine, and the eighty-second year of his passing.

## WISE INDIFFERENCE OF THE WISE IN ANESTHESIA\*

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*ώσπερ καὶ τὸ ιατρεύειν καὶ τὸ ὑγιάζειν οὐ τὸ τέμνειν η  
μὴ τέμνειν η φαρμακεύειν η μὴ φαρμακεύειν ἐστίν, ἀλλὰ τὸ ὄδι.*\*\*

Aristotle's Nicomachean Ethics,  
Book V. ix. 16.

JOHN Dewey, "the most profound and understanding thinker on education that the world has yet known" (Ernest C. Moore), has said repeatedly that mankind so far has been ruled by things and by words, not by thought. Humanity has not been in possession of the conditions of secure and effective thinking. Unless we master things, we shall continue to be mastered by them; the magic that words cast upon things may indeed disguise our subjection or render us less dissatisfied with it, but after all science, not words, casts the only compelling spell upon things.

Ideas of this nature have been presented by other philosophers off and on throughout the ages. Indeed, they correspond to the meaning of the title of this paper, "wise indifference of the wise," which is taken from a line in Tennyson's poem, *A Dedication*. Strabo, the Greek historian and geographer, writing about the year A.D. 18, seems to have been impressed with the great importance which the Stoic philosophers attached to the virtue of "marvelling at nothing," when he said: "Writers also add the changes resulting from the migrations of peoples, wishing to develop in us, to a still greater extent, that virtue of not marvelling at things (a virtue which is lauded by Democritus and all the other philosophers; for they put it in a class with freedom from dread and from perturbability and from terror)," (*Geography*; 1, 3, 21). By heaping up instances of marvellous occurrences, he hoped to remove doubt and encourage the scientific spirit.

Cicero, in his *de Finibus Bonorum et Malorum*, says of the philosopher generally, "Even if he supposed happiness to consist in knowledge, still he designed that his study of natural philosophy should procure him peace of mind; since that is his conception of the Chief Good, which he entitles "freedom from alarm" (V. xxix. 87).

It would seem that these illustrations are, from our point of view, included in the sense of the epigraph of this address, taken from Aristotle, namely: "Just as to practise medicine and healing consists not in applying or not applying the knife, in using or not using medicines, but in doing so in a certain way." Elsewhere, Aristotle mentions the quality of high-mindedness as being pre-eminent and to be taken as embodying the trait most prized in an Athenian gentleman, a man "not easily moved to admiration, for nothing is great to him. He loves to possess beautiful things that bring no profit, rather than useful things that

\*Address, delivered by invitation, at the Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Hot Springs, Va., Sept. 4 to 6, 1947.

\*\*"Just as to practice medicine and healing consists not in applying or not applying the knife, in using or not using medicines, but in doing so in a certain way."

—W. D. Ross, Oxford, 1925.

pay; for this is characteristic of the man whose resources are in himself. Further, the character of the high-minded man seems to require that his gait should be slow, his voice deep, his speech measured; for a man is not likely to be in a hurry when there are few things in which he is deeply interested, nor excited when he holds nothing to be of very great importance; and these are the causes of a high voice and rapid movements" (*Ethics*, IV, iii).

James Young Simpson wrote, in 1849, his book, called *Anaesthesia*, or the *Employment of Chloroform and Ether in Surgery, Midwifery, etc.* (Philadelphia: Lindsay & Blakiston): "The tyro looks at first upon the symptoms of an aggravated attack of hysteria as very serious. The physician of more experience knows they are not so. The stertorous breathing, the spasms, and almost convulsive symptoms, etc., sometimes produced by chloroform, may appear serious to those who have had little experience in the use of this agent. But everyone who has seen much of its effects knows that there is no danger following, but no inconvenience even left by such a show of serious symptoms." Coeval with Simpson, Dostoevsky told of one of *The Brothers Karamazou*, "that he was not proud of his fearlessness and seemed to be unaware that he was bold and courageous."

Numbers and numbers of other instances of *wise indifference* could be given, and, perhaps, particularly since one hundred years ago. Van Wyck Brooks (The World of Washington Irving) has written that "The forties were called in later times the 'mad,' the 'roaring,' the 'fabulous' forties, and this was indeed a singular decade in which, as Cooper said, the nation was passing 'from the gristle into the bone.' It was unique as a time of reforms and crazes, of Abolition and Fourierism, of 'esoterie anthropology,' of spiritualism, mesmerism, pathetism, phrenology, and what not. The nervous and mental interior turmoil implied in these various phrases—the battle-cries and banners of the forties—was matched by the turmoil of the outward life of this decade of 'Manifest Destiny,' the Mexican War, the Mormon trek, the settlement of Oregon. The most tumultuous years in the history of the country were those that led up to the climax of 1849; and yet their most notable aspect perhaps was this national mood of self-realization for which the American writers had prepared the way. . . . Already, in the early forties, there was an eager movement of mind in virtually every corner of the country. This was especially marked in New England, in Boston, in Cambridge, in Concord, but Charleston had its flowering too, the mind of Virginia was astir and Kentucky and Ohio were awake." Of such were the times when anesthesia became a reality.

Soon following, and seemingly antithetical somewhat to the theme of not marvelling, Walt Whitman wrote his *Miracles*:

Why, who makes much of a miracle?  
As to me I know of nothing else but miracles,  
Whether I walk the streets of Manhattan,  
Or dart my sight over the roofs of houses toward the sky,

Or watch honeybees busy around the hive of a summer forenoon,  
Or animals feeding in the fields,

These with the rest, one and all, are to me miracles,  
The whole referring, yet each distinct and in its place.

To me the sea is a continual miracle,  
The fishes that swim—the rocks—the motion of the waves—the  
ships with men in them,  
What stranger miracles are there?

LEAVES OF GRASS, VOL. II, 163.

All these thoughts may be summed up in the words of Sir Charles Sherrington, made not long ago in the *Gifford Lectures*, entitled, *Man on His Nature* (1937-1938), when in fancy he has Nature say to man: "Bethink you too that perhaps in knowing me you know the instrument of a Purpose, the tool of a Hand too large for your sight as now to compass. Try then to teach your sight to grow."

With reflections like these let us rejoice our poor hearts at this season of centenary celebrations concerning anesthesia; let us sing the praises of men like Long, Wells, Morton, and Simpson; and, without taking from these their glory, let us laud and magnify the good works of William Harvey, of Robert Hooke, of Robert Boyle, of John Mayow, of Joseph Priestley, of Antoine Laurent Lavoisier—le fondateur de la chimie moderne—, of Humphry Davy, of Michael Faraday, and of Henry Hill Hickman. In memory, let us do honor to all these men who gave hand in laying the foundation upon which was built the temple of anesthesia.

Last year in Boston there were meetings of dentists, of anesthetists, and of physicians and surgeons generally; all in commemoration of the hundredth anniversary of the first public demonstration of surgical anesthesia. Many papers were read, some belonging to the basic sciences, as these are related to anesthesia, and some dealing with the subject from the clinical point of view. An address, entitled, "*The Need for Wider Research*," was most brilliantly delivered by Raymond B. Fosdick. The audience was immeasurably moved by the seriousness of his remarks which were definitively provocative of thought for the future.

Not long after, the Association of Anesthetists of Great Britain and Ireland, in collaboration with the Royal Colleges of Physicians and Surgeons of England, held centenary celebrations in London. The outstanding features of this occasion were the unveiling of a plaque commemorating four British pioneers in anesthesia, namely, Henry Hill Hickman, James Young Simpson, John Snow, and Joseph Thomas Clover; and, the creation of *John Snow Medals*. These great gatherings, too, were elevating and brought to mind Samuel Johnson's *Inspiration*:

Breathing in the thinker's creed,  
Pulsing in the hero's blood,  
Nerving simplest thought and deed,  
Freshening time with truth and good,

This year, 1947, marks an additional centennium in anesthesia, for it was one hundred years ago that James Young Simpson introduced the use of chloro-

form in obstetric practice in Edinburgh, although a little earlier in the same year, Pierre Jean Marie Flourens, the French physiologist, had shown "that the inhalation of chloroform caused in animals the same temporary type of anesthesia caused by the inhalation of ether."

Everybody knows of the heated controversy which followed the production of anesthesia in the parturient woman, and everybody knows that while in France Guizot, the scholar-statesman, was preparing the way for a general system of state-aided popular education, Lamartine was poet, historian, and orator; and while in America, Melville was writing *Moby Dick*, Simpson won the dispute by virtue of the acceptance of chloroform *à la reine*. It would seem that Herman Melville had thought as Simpson did think when he opened the eighty-first chapter of *Moby Dick* with the expression: "There are some enterprises in which a careful disorderliness is the true method." The thought is not unlike that of our title.

John Snow, the first physician to devote his full time to anesthesia, although he knew the dangers of chloroform better than anyone at that time, preferred to use chloroform. "His biographer, Benjamin Ward Richardson, tells the story that Snow was once challenged to give his reasons for thus persisting in its use if, as on his own showing it appeared, either were so much safer. He is said to have replied: 'I use chloroform for the same reason that you use phosphorus matches instead of the tinder box. An occasional risk never stands in the way of ready applicability.'" No doubt he was of the good opinion, which ought to be more general, that the best method is not necessarily the least dangerous, but rather that which offers an *optimum* for expediency.

Following the excellent investigative work of John Snow which lasted about ten years, progress in anesthesia was slow but, during the next half century, there were several valuable contributions, notably by Albert Niemann through the production of crystalline cocaine in 1860; by Edmund W. Andrews through the addition of oxygen to nitrous oxide for more prolonged anesthesia in 1868; by Claude Bernard, who, from his experimental studies, pointed out in 1875 that anesthesia, like other branches of medicine, should be based on physiological principles; by Paul Bert through his demonstration in 1878 that nitrous oxide anesthesia could be prolonged when this gas is mixed with oxygen and given under increased barometric pressure; by Carl Koller, who first used cocaine for "local" anesthesia in 1884; by Carl Ludwig Schleich through the production of infiltration anesthesia in 1892; by August Bier, who, in 1898, after producing true spinal anesthesia in lower animals, successively caused it to be carried out on himself, his assistant, Hildebrandt, and his patients; by Emil Fischer and J. von Mering through their inception of the barbiturates in 1903, while Woodrow Wilson was President of Princeton; by Alfred Einhorn in 1904, with his discovery of procaine; and by S. J. Meltzer and John Auer demonstrating the usefulness of intratracheal insufflation in 1909.

These are some of the examples of progress in anesthesia during times marred by misunderstanding. Then there came Frances Hoeffer McMechan who brought together the better elements concerning anesthesia. In no time,

those who were truly interested in anesthesia, the world about, regarded him as the single individual with talents which everyone shares. From this time on, many advancements have been made. Professor Dennis E. Jackson in 1915 described a method of removing the carbon dioxide of the expired air during anesthesia so that the same agents may be rebreathed with continually added oxygen in suitable proportions. Later, Ralph M. Waters developed this principle of eliminating carbon dioxide in clinical inhalation anesthesia. The year 1920 is famous for the development of intratracheal anesthesia by Ivan W. Magill, for the development of all forms of regional anesthesia by Gaston Labat, for the work of Arthur E. Guedel on the signs of anesthesia, and for the extending of epidural anesthesia by Fidel Pagés. In 1922 A. Goodman Levy published his excellent observations on chloroform. In 1923 ethylene was used to produce anesthesia by W. Esson Brown and by A. B. Luckhardt, J. B. Carter and Isabella Herb. Avertin was first used in anesthesia by O. Butzengreger in 1926. The anesthetic properties of cyclopropane were demonstrated experimentally in 1928 by C. H. W. Lucas and V. E. Henderson, and this drug was used in man by Ralph M. Waters in 1930. In the same year, Chauncey D. Leake and M. Y. Chen brought forward divinyl ether. Evipan, a barbiturate, was given intravenously to produce anesthesia by H. Weese and W. Scharpf in 1932. Another short-acting barbituric acid derivative, pentothal, was introduced by John S. Lundy for intravenous anesthesia in 1934. The "continuous" method of spinal anesthesia was presented to the profession in 1940 by W. T. Lemmon. Harold Griffith initiated the employment of curare in anesthesia in 1942.

These are some of the recent innovations, pari passu, with which there have been several very particularly important improvements in anesthetic appliances made in England and in the United States, especially by Charles King, by Karl Connell, by E. I. McKesson, by R. von Foregger, and by J. A. Heidbrink. Simultaneously, too, there have been numerous publications dealing with the problems of anesthesia, many of them highly scientific and disclosing the results of the efforts of distinguished investigators.

These energetic men of wisdom, while indulging that lively element of thought, imagination, have been wisely indifferent of mystery and from their works have explained, in large part, some effects of the drugs used in anesthesia upon the vital processes which belong to the nervous system, to respiration, to the circulation of the blood. For example: J. H. Quastel (1939), from his studies on the high rate of oxygen consumption in the brain, has suggested that an anesthetic hinders the cells of a nervous center from oxidizing pyruvic acid, lactic acid, and dextrose; M. Jowett (1938) has shown that a definite inhibition of respiration is caused by anesthetic concentrations sufficient to produce narcosis, and suggests that the interference of dextrose oxidation may account for anesthesia; and some others have demonstrated that in high spinal anesthesia breathing is depressed, the heart is slowed, blood pressure is lowered, and red cells leave the circulation, these four factors seriously affecting tissue metabolism. Another example is the histotoxic action which many of the drugs used in anesthesia are capable of producing. It becomes manifest by acidosis and such

functional derangements as may be seen in the liver and elsewhere. Thus allured ineluctably, indeed ineluctably, we find ourselves following an illimitable course crossed, it is true, by many a bourne but with never-finishing frontiers, over each of which the beacons of those beyond become more and more beckoning as one by one measures are made sure. He who would go this way, in the language of Tolstoy, must eschew the only two sources of human vice, idleness, and superstition, and pursue the only two virtues, activity and intelligence.

At any stopping point one may see many ways from which to choose among the Jeffersonian. More particularly, an anesthetist now-a-days is bound to consider the functional activity of the capillary bed as it is being looked into by Robert Chambers and B. W. Zweifach; he must be familiar with capillary permeability as regarded by Eugene M. Landis, and with the relation between intercellular substance and tissue growth now being shown by Eliot R. Clark; he must follow the course of protein outside the vessel and in the lymphatic system, which is being studied by Cecil K. Drinker; it becomes his duty to watch with William E. Ehrlich the function of the lymphocyte; and, seeing that the problems in nutrition as regards proteins, their hydrolysates and proteases are of such general importance, it is necessitous for him to know the works of James B. Allison, John P. Peters, Robert Elman, and G. H. Whipple. Good reference to the publications concerning studies like these is given in the Annals of the New York Academy of Sciences of last year.

But these are not all of the cynosures of the anesthetist, for beyond even the fundamentals of oxidation and respiration (L. Michaelis), there are those matters of education, the general principles of which pervade the thoughts of our leaders, James B. Conant, and Sir Richard Livingstone, for examples. Increasingly our universities are supporting more prolonged postgraduate courses in anesthesia.

Inexorably the investigator flags not nor swerves from the path of discovery, while he does not allow himself to marvel immoderately. He will keep in mind the advice of Horace:

Nil admirari prope res est una, Numici,  
solaque quae possit facere et servare beatum.

Hunc solem et stellas et decadentia certis  
tempora momentis sunt qui formidine nulla  
imbuti spectent.

Vive, vale. Siquid novisti rectius istis,  
candidus imperti; si non, his utere mecum.

EPISTLE VI.

Translation:

"To wonder at nothing is about the one and only thing, Numicius, which can make a man happy, and keep him so. This sun and stars and seasons which depart at regular periods, some there are who view, not infected with any dread: . . . Live long, farewell; if aught you know more true than these precepts which you read, frankly impart them to me; if not, like me, use these."

James Lonsdale and Samuel Lee, Macmillan & Co., 1908.

## SINGLE INJECTION CAUDAL FOR OBSTETRICAL ANALGESIA AND THE USE OF PONTOCAINE

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**C**AUDAL anesthesia is reported<sup>1</sup> to have been first described by Cathelin in 1901, and adapted to obstetric procedures by Stoeckel in 1909. Since then many workers<sup>3</sup> have employed it, but its usefulness was limited almost entirely to the perineal phase of labor and delivery, since only a single injection was given. In this phase of parturition other agents were more effective, so that local and caudal anesthesia in obstetrics made little progress. In 1939, Lemmon<sup>2d</sup> reported a "continuous spinal technique by which the duration of anesthesia from intraspinal injections could be prolonged more or less indefinitely." Hingson and Edwards<sup>3b</sup> modified this technique to provide continuous caudal anesthesia. This method employed a malleable needle placed in the caudal canal so that frequent intermittent injections of short acting local anesthetic agents could maintain anesthesia for many hours.

This method achieved brief popularity and still offers much to the patient in labor. As would be expected, many difficulties were encountered, and studies have been continued to improve on this basic principle. The chief problems encountered in continuous caudal anesthesia included neurological changes induced by the needle, dislodgment of the needle, necessity of constant attendance of a physician, and technical difficulty in placing the malleable needle. It was decided to make a clinical study in which the anesthesia was prolonged by the use of long acting drugs instead of by an indwelling device. This paper reports our observations on a single injection caudal technique.

The experience of Brown<sup>4</sup> and others<sup>5</sup> suggested that pontocaine in normal saline solution would be satisfactory for clinical use. The fixation of this agent in the nerves of the caudal canal was augmented by the addition of adrenalin. A 22 gauge Pitkin needle was selected because of its flexibility, small size, and ease of handling. It can be introduced without a local anesthetic wheal which obscures the caudal hiatus. It was technically much easier to place than the malleable needle or the catheter. The first observations were made using 30 c.c. of 0.1 per cent pontocaine solution in 0.9 per cent NaCl solution with added adrenalin.

Several difficulties were promptly encountered. The level of the cutaneous anesthesia varied from just above the symphysis to above the umbilicus. It was also noted that cutaneous anesthesia to the umbilicus was not uniformly associated with relief from the pain of uterine contractions. Because of these factors many of the patients obtained only partial relief from uterine pain. It was impossible to confirm the observations of Hingson and Lull<sup>1</sup> that uniformly satisfactory analgesia can be obtained with levels of cutaneous anesthesia between the symphysis and umbilicus. Fifteen to twenty per cent of the patients will suffer uterine pain even with cutaneous anesthesia at the umbilicus. It seems rather that consistent relief of the abdominal pain of uterine contractions requires cutaneous anesthesia nearly to the costal margin.

In an attempt to increase the duration and effectiveness of the anesthesia, similar amounts of a more concentrated pontocaine solution (0.2 per cent) were

employed. These frequently failed either because the level of anesthesia was insufficiently high to produce satisfactory analgesia or the amount of pontocaine induced toxic reactions.

A survey of these data suggested that the volume of the caudal canal varied widely, and that the incidence of toxic reactions from pontocaine introduced into the caudal space increased rapidly when the dose exceeded 40 mg. (Figs. 1 and 2). Satisfactory clinical results apparently depended on placing an adequate but subtoxic amount of drug in a volume of diluent sufficient to fill the epidural space up to the eighth or sixth thoracic segment.

Two factors might conceivably influence the level of anesthesia obtained from any given volume of injected anesthetic solution: the rate of injection and the capacity of the epidural space up to the desired level. Since the rate of injection was relatively constant (as rapidly as the solution could be injected through a No. 22 needle, about 1 to 2 c.c./second), it seemed probable that the height of anesthesia was a function of the volume of injected material. Thus it became apparent that for a single injection technique to be effective some method of estimating the volume of the epidural space to the required level was necessary.

At this point, it was decided to estimate the capacity of the epidural space by using a fixed volume of a relatively nontoxic agent such as procaine. Depending upon the results obtained, one could then inject pontocaine solution in appropriate volume and concentration to obtain an adequate level of anesthesia for any given patient. Thirty cubic centimeters were selected, since this is the most commonly suggested volume for adequate anesthesia. By determining the height of anesthesia obtained with 30 c.c. of procaine solution the volume necessary to obtain cutaneous anesthesia between the umbilicus and costal margin could be estimated.

### Technique

The following technique was developed: the analgesia is begun when the patient is definitely in labor and complaining of pain, provided no contraindications to caudal injection are present.

1. Under aseptic conditions a 22 gauge Pitkin needle is introduced directly into the caudal space, the patient lying on her side.
2. Due precautions are taken to ascertain that the needle is not in the intrathecal space or in a blood vessel.
3. Thirty cubic centimeters of 1 per cent procaine solution are injected moderately rapidly (1 to 2 c.c. per second). This injection permits the anesthetist to determine clinically by standard signs and symptoms that the needle is in the proper space. It also permits the clinical estimation of the volume of the caudal canal and epidural space by determining the level of the anesthesia obtained with this volume. The needle is left in place during the ten to fifteen minutes necessary for the level of the anesthesia to be developed.

4. Thirty to 40 mg. of pontocaine are prepared in a volume of saline solution estimated from the height of anesthesia obtained with 30 c.c. of procaine.\*

\*For example, if 30 c.c. of procaine solution produces anesthesia to the level of the umbilicus, the volume of pontocaine solution should not exceed 35 c.c. On the other hand, if 30 c.c. of procaine solution produces anesthesia only to the symphysis, 40 to 50 c.c. would be necessary to obtain adequate obstetric analgesia. No fixed concentration of pontocaine is used: rather 30 to 40 mg. of pontocaine is dissolved in 30 to 50 c.c. of saline, producing a 0.1 per cent to 0.05 per cent solution.

5. Ten to fifteen drops of 1:1,000 adrenalin are added and the pontocaine solution injected moderately rapidly (1 to 2 c.c. per second).

6. The needle is withdrawn and the patient turned on her back or on the opposite side according to clinical indications.

7. If the membranes are intact, they are ruptured providing there is no obstetrical contraindication, and the patient is returned to her bed.

## TOXIC REACTIONS

Mgm. Pontocaine Causing Reaction

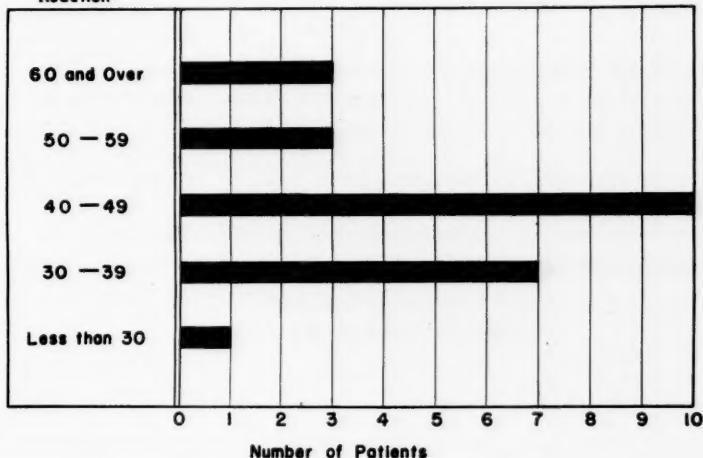


Fig. 1.—The incidence of toxic reactions correlated with the amount of pontocaine injected. There were twenty-four patients with reaction at some time during their analgesia; often the reaction occurred with only one of two to three injections.

## VOLUME OF ANESTHETIC SOLUTION AS SINGLE INJECTION NECESSARY FOR SATISFACTORY ANALGESIA

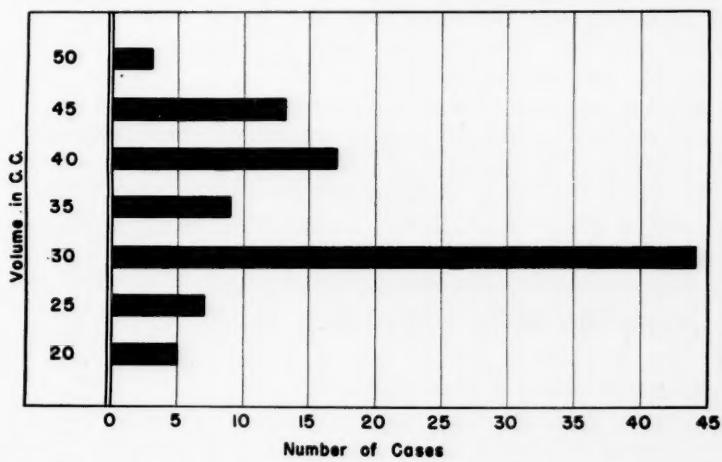


Fig. 2.—Total cases, 98; with adequate record. If 30 c.c. are selected, 12 per cent would receive an overdose and 33 per cent an inadequate amount. If 35 or 40 c.c. are selected, it is to be presumed that some of the patients with a small volume epidural space would have had excessively high anesthesia; also with this volume of medication, 16 per cent of the patients would not have had satisfactory analgesia for labor (uterine contraction pain).

TABLE I. GENERAL DATA

	NO. CASES	1ST STAGE	2ND STAGE	3RD STAGE	OUTLET FORCEPS WITHOUT ROTATION	OTHERS WITH OPERA- TION*	SPON- TANEOUS DELIVERY	ASPHYXIA MILD MOD.	FETAL DEATHS
Primipara	43	14h18'	1h37'	7'	30	2	11	4	1
Multipara	63	9h28'	44'	5'	24	5	34	1	0
Total	106				54/50%	7/7%	45/42%		

\*Breech extraction—midforceps, low forceps with rotation—twins, etc.

†One child premature weighed 1,035 grams. One child—macerated stillborn.

### Data

One hundred forty-eight patients have been studied. The usual obstetric data are presented in Table I. Of these, 106 had completely satisfactory anesthesia, or nearly so, and 42 were partial or complete failures. Most of the complete failures were due to technical difficulties, while the partial failures were usually attributable to insufficient volume of anesthetic solution (Table II).

TABLE II. REASON FOR FAILURE

	NO. CASES
Technical and anatomic causes	31
Time too short	7
Severe toxic reactions	1
Only partial relief	2
Uncooperative patient	1
	—
Total cases	42
Successful 72%*	

\*This includes attempts by house staff and interns and the earlier experience of the study. The personal experience of the author approximates 85 per cent successful.

The duration of the analgesia ranged from six hours to forty-five minutes and decreased with succeeding injections of pontocaine. There is no good explanation for this phenomenon. Clinically, the average duration of analgesia with the first injection was three and one-half hours, while the average of the second and third injections was two and three-fourths hours, and the average of the fourth injection one and one-half hours (Table III).

Despite the fact that the level of the anesthesia was carried somewhat higher than has been previously recommended, vasomotor reactions were minimal. They are tabulated in Fig. 2 and Table IV. Changes in pulse and respiration were not significant. With one exception toxic reactions were mild. Significant depressions of blood pressure occurred in five patients. (Table IV.) One of these (R. N.) occurred after the use of a 0.2 per cent pontocaine solution and was probably due to a toxic reaction rather than to a vascular change. This patient received 75 mg. of pontocaine in an attempt to raise the level of anesthesia. Barbiturates and oxygen therapy were employed: convulsions or unconsciousness did not develop. Labor progressed during this reaction and delivery occurred satisfactorily before the analgesia wore off.

The majority of these patients were delivered by outlet forceps (Table I) because of the lack of a bearing down reflex. In some patients the caudal analgesia was permitted to wear off in the belief that as it receded the bearing down reflex would be restored and spontaneous delivery would occur. This was not the case, for the anesthesia receded segmentally from above downward. As the anesthesia wore off the patients suffered uterine pain prior to the return of the perineal reflex. With the loss of the coordinating influence of the bearing down

reflex the patients became uncooperative and it was necessary to introduce an inhalation anesthetic agent for delivery. It was also observed that as the caudal anesthesia wore off many patients suffered abdominal pain from uterine contractions but still had sufficient pelvic and perineal anesthesia to permit episiotomy, forceps delivery, and repair without additional anesthesia.

TABLE III. DURATION OF ANALGESIA

		AVERAGE DURATION OF ANALGESIA
First injection		3 hours 19 minutes
Second injection		2 hours 42 minutes
Third injection		2 hours 59 minutes
Fourth injection		1 hour 21 minutes
Range	Longest*	6 hours 10 minutes
	Shortest	45 minutes

This is the average duration of each injection in patients who had more than one injection, or in whom the anesthesia was permitted to wear off.

\*One patient had severe toxic reaction from 75 mg. pontocaine and her analgesia lasted 7 hours and 10 minutes.

TABLE IV. TOXIC AND VASOMOTOR REACTIONS

PATIENT	TYPE OF REACTION
P. C.	Blood pressure 76/40 for ten minutes
P. S.	Nausea and emesis, once
M. H.	Nausea and emesis, once on second injection
R. W.	Nausea and emesis on fourth injection
E. L.	Nausea and emesis, slight with first injection
B. H.	Slight nausea
V. R.	Nausea and emesis, once
N. G.	Nausea and emesis
F. N.	Nausea and emesis, once
H. G.	Nausea and emesis
D. B.	Emesis, two times
T. P.	Nausea and emesis
M. S.	Nausea
C. L.	Nausea and emesis
L. H.	Nausea and emesis, two times, B.P. 80/40
O. H.	Nausea and emesis
E. M.	Headache
E. G.	Headache
H. C.	Dyspnea, B.P. 70/30
V. B.	Nausea and headache
R. N.	Nausea, cyanosis, emesis, headache, B.P. 60/40
A. W.	Nausea, headache, B.P. 66/40
B. B.	Nausea, B.P. 90/40
D. B.	Nausea and emesis

Blood loss under caudal analgesia is reduced. This observation has been reported by others and is confirmed by this series. Despite the fact that many of these deliveries were managed by students and residents, the average blood loss for primiparas was 186 c.c. and for multiparas 133 c.c. or an average of 145 c.c. Only twenty-one patients had a blood loss of 200 c.c. or over (Fig. 3).

Perhaps the greatest single advantage of caudal analgesia and anesthesia in obstetrics is obtained for the baby. There was no significant asphyxia in the infants who were delivered under caudal anesthesia alone. All infants cried spontaneously following the clearing of the airways and/or gentle skin friction. Of the children whose mothers required inhalation agents as an additional anesthetic for delivery (using the caudal for analgesia), one required stimulation with contrast baths and oxygen; none were severely asphyxiated. There were two fetal deaths. One was a premature infant weighing 1,035 Gm. and the other a macerated stillborn child (Table I).

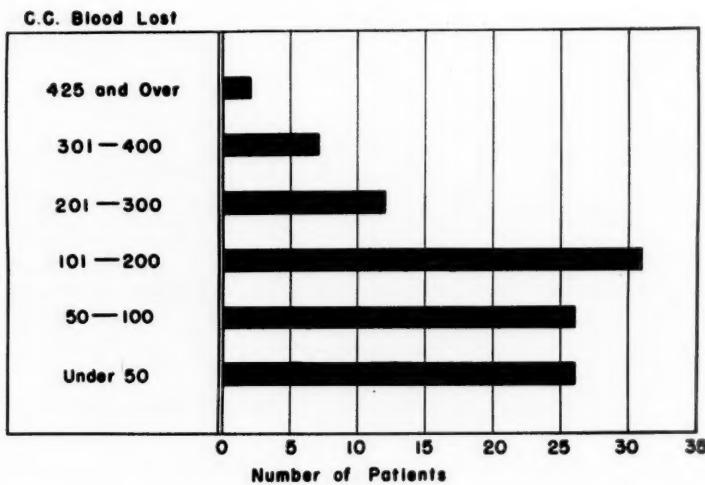
**BLOOD LOST**

Fig. 3.—Blood loss in patients delivered under caudal analgesia and anesthesia. The blood loss is recorded as measured and/or estimated. The sum of these two is the total recorded blood loss. Average 145 cubic centimeters.

**Discussion**

These observations confirm those of other investigators on caudal analgesia. Single injection caudal like continuous caudal anesthesia modifies all three stages of labor. The mechanism of this altered physiology has not been determined. The first stage is shortened appreciably. The second stage of labor is prolonged depending on the duration of the anesthesia. No precipitate or unattended births occur; as long as the anesthesia is adequate, the patient comfortably waits for the obstetrician. The third stage is considerably shortened and the blood loss is minimal. The puerperium is unaffected. In this series a few patients required catheterization during the first twenty-four hours post partum. There were no neurological complications.

In addition, there are certain other clinical advantages of the single injection method which should be mentioned. Caudal analgesia offers much to the woman in labor and has many advantages to her child. However, the technical problems, the complications, and the amount of time required of the physician by multiple injection techniques have greatly reduced its use.

The use of the small gauge flexible needle, instead of the larger caliber malleable needle or trocar and catheter, greatly facilitates the proper placing of the needle. The smaller needle obviates the necessity of a local wheal which often obscures the hiatus, and the stiffer needle makes introduction much easier.

The estimation of the volume of the caudal and epidural space permits fairly accurate individualization of the volume of the injected drug, and thus insures more satisfactory clinical results and fewer toxic reactions.

This technique permits the use of the more toxic but longer acting drugs which produce three to five hours of anesthesia from a single injection. Any toxic or vasomotor reactions occur within the first ten to fifteen minutes following the injection. The physician may then safely leave his patient to the care

of a nurse for several hours. This freedom has obvious advantages in private practice.

Lest one feel this is a panacea for the problem of obstetric analgesia and anesthesia, a word of caution is in order. The same problems, complications, and risks inherent in continuous caudal analgesia must be considered with this method. The same safeguards for the injection of local anesthetic drugs and for caudal anesthesia must be observed with this method. They have been re-cited in other publications and are not repeated.

Nevertheless, with reasonable safety, one can largely obtain the following four freedoms of obstetrics:

1. Freedom from labor pains
2. Freedom from fetal asphyxia
3. Freedom from the risks of the inlying needle or catheter
4. Freedom from constant physician attendance

### Summary

1. This report details observations on single injection pontocaine caudal anesthesia in labor and delivery.
2. A technique is described by which the volume of the caudal and epidural space can be estimated by injecting 1 per cent procaine solution thus permitting the injection of the proper amount of pontocaine solution.
3. Analgesia lasting from three to five hours may be obtained by single injections of pontocaine solution.
4. The relief of pain during labor and delivery is satisfactory when adequate levels of anesthesia are obtained.
5. This single injection technique is clinically easier than the continuous methods.

Acknowledgment is gratefully made to Dr. Stuart Cullen for his suggestions and help. The pontocaine solution used was generously supplied by Winthrop Chemical Company.

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# Department of Reviews and Abstracts

## Selected Abstracts

### Malignancies

**Cantone, C.: Early Primary Carcinoma of the Isthmus,** La Ginecologia 12: 331, 1946.

Cantone reviews the literature on primary carcinoma of the isthmus, and mentions the opinion of some authors doubting the very existence of the isthmic carcinoma as a separate entity, and relates a case of his own observation, in which the lesion was no more than a pinpoint ulceration, in the center of the isthmus, so that no doubt could arise of its primary place of origin.

GEMMA BARZILAI.

**Curran, John F., and Kilroy, Edward A.: Coexistent Primary Carcinoma of the Fallopian Tube and of the Breast,** New England J. Med. 236: 64, 1947.

The authors report a patient on whom a supravaginal hysterectomy and left salpingo-oophorectomy was performed. At the same operation a breast tumor was removed. Ten days later a radical mastectomy was performed.

The left tube proved to be a primary carcinoma, and the breast tumor was a primary medullary carcinoma. X-ray or radium therapy was not given the patient postoperatively.

A few of the more important considerations regarding the incidence, diagnosis, and treatment of primary carcinoma of the Fallopian tube are discussed. JAMES P. MARR.

**Barigozzi, C., and Cusmano, L.: Studies on Chromosomes in Human Cancer Cells,** Bollettino Della Societa Italiana Di Biologia Sperimentale 22: 1, 1946.

In a study of six cases of basal cell carcinoma of the cervix, Barigozzi and Cusmano demonstrated mitotic figures in which a peculiar aspect of chromosomes is present, that may be quite significant.

The material was prepared according to Barigozzi's technique for demonstration of chromosomes (fixation in alcohol-acetic acid, crushing and dyeing with neutral red).

Mitotic figures were seen with 24 chromosomes with evident longitudinal ridge, undergoing a metaphasic stage, similar to a reduction phase in a myosis. In others, a profasis corresponding to a pachitenic phase was evident. In still others, showing a pro-metaphase stage, terminal chiasma were absent, and reduction to an aploid number of chromosomes was the end-result. The reduction of an ordinary diploid nucleus to an aploid one has not been observed as yet in human body cells. This finding bears some analogy to Evans and Syezey and Hearnes' statements, and to what has been observed in mice cells cultivated in vitro and treated with carcinogenic hydrocarburates.

GEMMA BARZILAI.

### Endocrinology

**Leathem, James H.: Further Studies on Antigonadotropin Formation Following Gonadotrophic Hormone Administration,** Am. J. Physiol. 148: 700-707, 1947.

Leathem ascertained experimentally that antigenadotropin formation against a combination of sheep anterior pituitary extract and human chorionic gonadotropin ("Synapoidin") could be induced more rapidly in the rabbit by subcutaneous than by the

intravenous route of administration. These inhibitory substances disappeared within twenty to forty days. Animals given a reinjection series demonstrated that antigenadotropins formed more readily and persisted for a greater length of time forming hormone administration in a reinjection series.

The author also observed that, despite the reduction in gonadotrophic potency induced by standing at room temperature, there was indicated no evidence of a decrease in ability to elicit antihormone formation.

The antigenadotropins were shown to possess a nonspecific nature by the ability of serum to nullify the gonadotrophic action of pregnant mare serum and human chorionic gonadotropin in the male and female rat. Furthermore, human pituitary and male rat pituitary extracts were antagonized in the female rat, but the male rat pituitary solution was not inhibited in the male test animal. Gonadotrophic extracts of reduced potency through aging process elicited a nonspecific inhibitory serum from injected rabbits.

The writer found a pronounced inhibitory effect on the reproductive system of male mice following the administration of the antigenadotrophic serum. There was atrophy of the gonads and castration-like changes in the pituitary gland. The testes of serum-treated mice averaged only 24 Gm. and were devoid of spermatozoa, whereas the testes from the controls averaged 99 Gm. and all exhibited spermatozoa. The seminal vesicles too reflected the effect of antigenadotrophic serum; the treated series averaged 7 mg. each compared to 26 mg. in the control group. Furthermore, the adrenal X-zone which normally disappears with the maturation of the male reproductive system and was absent in the controls was found to be present in the serum-treated mice, a further indication that androgen was not being excreted.

C. E. FOLSOME.

**Sammartino, R., and Blanchard, O.: Placental Changes in the Rabbit and Abortion Induced by Estrogens, Obst. y Ginec. Latino-Am. 4: 533-549, 1946.**

The authors studied the placental changes which occur in rabbits after the parenteral injection of estrogens. The latter brought about fetal death and expulsion from the uterus in the second half of pregnancy on the fifth, sixth, and seventh day following a single injection of estrogen. Larger amounts of estrogen were given and over varying periods of time, and the uteri and placentas were studied. It was found that when the injection of estrogen produces an abortion it does so by altering the maternal circulation which seems to exert a pathologic effect directly on the fetal ectoderm. No disturbances were observed in the corpus luteum.

J. P. GREENHILL.

**de Santiago, A. P.: Implantation of Pellets of Progesterone, An. brasil de ginec. 21: 434-439, 1946.**

The author implanted pellets of progesterone into four patients. Three of the patients suffered from menometrorrhagia of puberty, and the fourth had a threatened abortion. The pellets contained from 50 to 100 mg. of progesterone, and implantation was early performed under direct infiltration anesthesia. In one patient an aseptic suppurative process occurred, and the remains of the pellet were expelled. This occurred after the uterine bleeding had stopped. The author believes that the body treated the pellet as a foreign body which was no longer needed. The results in all the cases were satisfactory.

J. P. GREENHILL.

### Gynecology

**Casabona, Umberto: Tuberculosis of Cervix, La Ginecologia 12: 2, 1946.**

Casabona describes a case of tuberculosis involving a small district of the cervical canal solely, between the internal and external os. This extremely rare intracervical localization of the disease has formerly been described by Pestalozza, Cova, Kaufmann, Alfieri, and Brouha, and signs and symptoms thoroughly discussed.

The main interest arises from the fact that the disease is easily overlooked, and furthermore easily mistaken for carcinoma when discovered.

In Casabona's case, early and correct diagnosis was made because of the association of a primary tuberculosis of the lung, and secondary amenorrhea of two years' duration in a 31-year-old woman, and the presence of a sticky, mucopurulent vaginal discharge containing Koch's bacilli.

The lesion was of finely branching papillary type, the covering epithelium recalled the tall cervical type, while in others, cells appeared swollen, filled with an opaque secretion product quite different from normal mucus. Cervical glands looked fairly normal, except for exudate in lumen and dilation. The connective tissue stalks contained giant cells and lymphocytic infiltration. After the surgical ablation of the diseased area of the cervix, menstrual flows reappeared, the discharge stopped, and Koch's bacilli were not found again. A survey of theories related to formal pathogenesis of amenorrhea in early and circumscripted tuberculosis of the genital tract is given.

GEMMA BARZILAR.

**Guerriero, William F., Jennett, R., and Mantooth, W. B.: Infectious Granulomatous Lesions of the Cervix, J. A. M. A. 133: 832, 1947.**

The authors classify the infectious granulomas of the cervix as those resulting from tuberculosis, granuloma inguinale, syphilis, and chancre. Their clinical importance depends upon their differentiation from carcinoma. In about 85 per cent of the cases tuberculosis of the cervix is secondary to disease of the Fallopian tubes, lungs, genitourinary and gastrointestinal tracts. The various pathologic types of ulcerative, miliary, papillary, and bacillary catarrhal are described. Leucorrhea and bleeding are prominent symptoms. Generalized systemic symptoms may also be present. Treatment may be curative or palliative.

Like tuberculosis, granuloma venereum cervicitis will be found with correct diagnosis to be a relatively common lesion, particularly in the Negro. It is frequently difficult to differentiate from carcinoma, and the lesions may extend to the adjacent tissues. The diagnosis depends upon the finding of Donovan bodies in the smear or scrapings or biopsy. The diagnosis is not a simple matter. Therapy is general, local, and specific. General therapy consists of adequate diet, penicillin, and sulfonamide compounds. Local therapy in the form of sulfonamide jellies may be of benefit. Specific therapy consists of the administration of antimony compounds over a period of six months. Special complications may result when the disease occurs during pregnancy.

Cervical syphilis may be primary, secondary or tertiary. Chancre of the cervix does not present the same clinical manifestations as a similar lesion of the outer genitals. Microscopically the biopsy represents a picture of chronic inflammation and only the finding of *spirochaeta pallida* by dark-field examination in early lesions will substantiate the diagnosis. In late lesions the diagnosis is made by positive serology and biopsy.

Chancre of the cervix is rare. It is caused by the gram-negative, *Hemophilus ducreyi*. Diagnosis is made by smear culture, skin test, and biopsy. The smear is the conclusive method of diagnosis and positive culture are effective only in about 40 per cent of the cases. Treatment consists of the administration of sulfathiazole parenterally and locally for seven to ten days.

WILLIAM BERMAN.

### Gynecologic Operations

**Stearns, Howard C.: A Report on Experience With Vaginal Hysterectomy, West. J. Surg. 55: 220, 1947.**

The author relates his experience with vaginal hysterectomy. He feels that the operation has never been given its rightful place in American Gynecology. In considering any technique for vaginal hysterectomy, the importance of the cardinal and uterosacral ligaments to support the vaginal vault must be constantly borne in mind. He criticizes the Mayo technique because

it fails to utilize these supports and, therefore, the incidence of cul-de-sac hernia following the operation is high. Surgical procedure evolved by him is as follows:

Cervix grasped with tenaculum; transverse incision over anterior cervix; anterior vaginal mucosa dissected from bladder with scissors; vesicovaginal fascia separated from the mucosa; incision carried around posterior vaginal cuff and the cul-de-sac opened with scissors; uterosacral ligaments grasped with Heaney clamps, cut and tied; the anterior cul-de-sac is opened; the lateral cervical tissue, including the lower border of the cardinal ligaments, is cut and ligated, leaving the ligatures on both the uterosacral and cardinal ligaments long; the broad ligaments are then ligated and allowed to retract; on reaching the top of the broad ligament the ovarian ligaments and the tubes are ligated; the uterosacral ligaments and the cardinal ligaments are sutured to the posterior vaginal cuff, thus supporting the vagina and closing the cul-de-sac.

Cystocele and urethracele are treated by suturing over the previously dissected fascia. The mucosa is closed with interrupted chromic.

The posterior vaginal relaxation is then corrected by high approximation of recto-vaginal fascia and closure of vaginal mucosa.

WILLIAM BICKERS.

### Miscellaneous

**Martin, Gustav: Chronic Avitaminosis E in the Castrate and Non-Castrate Rat**, Am. J. of Physiol. 148: 344-349, 1947.

Martin, using six series of fifty rats in each group, including two series of controls, found that chronic avitaminosis E symptomatically ran a markedly different course in the castrate and noncastrate rat. Three lines of evidence exhibited the effect of castration on this vitamin deficiency state. In the deficient E and castrate series the life spans were prolonged; the weight curves improved and there was a marked accumulation of fat.

The histopathology of the testis in avitaminosis E, in rats, is well known. There is irreversible degeneration of germinal epithelium. The Sertoli cells remain. It is the generally accepted view, according to Martin, that the interstitial cells of the testis are sources of androgen. Testosterone brings about spermatogenesis by stimulating the pituitary to secrete gonadotrophic hormones. Martin notes in his discussion, however, there seems to be no report of the testosterone content of testicles in the avitaminotic E rat.

C. E. FOLSOME.

**Bessis, M.: A New Biologic Test to Detect Anti-Rh Immunization**, Gynec. et Obst. 45: 493, 1946.

If two intravenous injections of Rh-positive blood, 0.5 c.c. each, are given to an Rh-negative individual, titration of his blood for anti-Rh agglutinins one week later will clearly indicate a prior isoimmunization. Thirty Rh-negative volunteers failed to develop any agglutinins, whereas four women who had previously borne erythroblastic infants developed titers in the range of 1:128 (which disappeared in sixty days). The author suggests this procedure to determine Rh factor responsibility where there is a history of atypical transfusion reaction, or of repeated fetal misadventures of various kinds. It is argued that the dose of Rh-positive blood is too small to cause a reaction in persons already strongly sensitized, or to cause an original sensitization.

IRVING L. FRANK.

### Newborn

**Tortora, M.: Vaginal Smears in the Genital Crisis of Female Infants**, Arch. di Ostet. e Ginec. 51: 290, 1946.

The author reviews the literature on the subject of cyclic variations in the vaginal mucosa of sexually mature women and compares cell types present during the monthly cycle to cell types present in vaginal smears taken during the genital crisis of female infants.

In a series of thirty infants—twenty-one born at term and nine premature—vaginal smears were taken daily for a period of ten days. Besides cell types, the vaginal flora and pH were determined.

In the first three days, deep cells of Shorr's type II and intermediate pionotic cells are predominant, but some cells of Shorr's type IV with fine granulations of the cytoplasma, and some completely cornified cells are present.

On the fourth to fifth days, deep cells of type I, small oval cells with sharp outlines appear, and deep cells of type II increase, while the intermediate and cornified cells diminish.

From six to ten days, intermediate cells disappear, while cells of type II seem to predominate again. Leucocytes, red blood corpuscles, and mucus are abundant in this period. The pH shows at birth a value of 5.5, and becomes lower during the next days. On the first day, the vaginal secretion is usually sterile. On the second day, cocci are predominant, and starting with the third day, Döderlein bacilli appear. In premature infants, the differences in the cellular types are less evident.

GEMMA BARZILAI.

### Pregnancy

**Vara, Paavo: On Late Second Childbirths,** Ann. Chirurg. et Gynec. Fenniae 35: 20-40, 1946.

The author reviews the obstetric data on 1,606 late secundipara cases, in which the time interval between deliveries had been at least six years, at the University of Helsinki's Women's Clinics I and II, in the interval of 1927 to 1944. As control data he selects a series of 3,680 secundipara cases wherein the second delivery occurred less than the longer six-year period in his study series. Among the 1,606 late secundipara cases, 92.77 per cent were spontaneous deliveries, 5.11 per cent were operative, 2.18 per cent breech presentations, and 0.25 were deflexion presentations. As the interval between deliveries was extended, the author observed that 75 per cent of his case material were over 30 years of age, while the 40-year-old patients were present in larger number in special group of late secundiparas as compared to secundiparas in the control series.

The duration of labor—thirteen hours and twenty-one minutes—was greater in the late secundiparas than in the control group. This increase in duration resulted from a lengthening of the first stage (twelve hours and forty minutes), while the duration of the second stage (twenty-seven minutes) and third stage (fourteen minutes) did not differ from the control series.

Premature rupture of the membranes showed an increased incidence among the late secundipara but seemed to show no negative effect upon prognosis. The incidence of operative deliveries among the late secundipara than among the secundipara bearing children less than six years apart. The prognosis of mother and infant was no poorer in the study group when compared to the control group. The study group, 1,606 cases, gave a maternal mortality of 0.06 per cent, and infant mortality of 1.00 per cent.

The incidence of postpartum hemorrhage showed a marked increase, but only in those cases delivering premature infants.

The author concludes that we are justified in holding as unfounded the fear among parturients that childbirth offers special difficulties in cases where a long interval has elapsed between deliveries. The only exception was in that smaller group of late secundiparas where an interval of fifteen years supervened. These cases in particular should be hospitalized.

C. E. FOLSOME.

**Ingerslev, Magens, and Teilum, Gunnar: Biopsy Studies on the Liver in Pregnancy. I. Normal Histological Features of the Liver as Seen on Aspiration Biopsy,** Acta obst. et gynec. Scandinav. 25: 339-351, 1945.

The authors, reporting from the Lying-In Department of the Rigshospital, Copenhagen, reviewed the literature upon the subject of the histologic picture of the liver in normal pregnancy. The writers contend that aspiration biopsy of the liver through the midaxillary line, under ether or chloroform anesthesia, at the time of other surgical procedures. In the six

nonpregnant women free of symptoms of liver lesions, the major surgical procedures, beyond liver aspiration biopsy, included dilatation of the cervix in two instances and along with a cervical amputation, a ventrosuspension of the uterus, a salpingo-oophorectomy and a bilateral salpingectomy in the four remaining cases. The liver specimen was fixed in ten per cent formalin, else Helly's fluid and stained with hematoxylin-eosin or by the van Gieson-Hansen method. Some of the specimens were stained also with Sudan III or Best's carmine stain.

The authors are of the opinion that this data, supplemented by experimental findings (rats and rabbits), demonstrates that the light and dark liver cells—Forsgren phases in human liver—are produced by the fixative used and probably due to a more rapid fixation of the cells in the marginal zone—in contrast to the central part of the specimen where the water phase of the fixative fluid asserted itself more strongly to bring about an absorption of water by the cells, which swell before their fixation becomes pronounced. No histological evidence was found which might indicate rhythmic phases in human liver function. The writers consider this evidence representative and reliable data as the basis for studies on the structure of liver tissue in biopsy specimens under morbid conditions. Their paper is accompanied by one chart and four photomicrographs.

C. E. FOLSOME.

### Labor

**Odell, L. D., Randall, J. H., and Scott, G. W.: Prolonged Labor With Special Reference to Postpartum Hemorrhage.** *J. A. M. A.* 133: 735, 1947.

The authors define a prolonged labor as one lasting thirty hours, one that terminates within three hours as precipitate, and the remainder as normal. When the total blood loss is 600 c.c. or more a diagnosis of postpartum hemorrhage is made. Prolonged labors formed 2.7 per cent of the total number of deliveries over a six-year period with primiparas forming 66.9 per cent of this group. The principal causes of prolonged labor are cephalopelvic disproportion, abnormal fetal presentations, and uterine inertia. In the authors series uterine inertia was the principal cause of prolonged labor. Postpartum hemorrhage was more frequent following prolonged labor. In some cases the bleeding was due to prolonged anesthesia and the trauma of operative deliveries, but in nonoperative deliveries the bleeding was due to postpartum uterine atony. The authors recommend in these cases careful conduct of the third stage, early uterine massage, and the use of oxytocic drugs, as well as, the use of fluids and whole blood when necessary.

WILLIAM BERMAN.

**Schlicke, Carl P.: Ectopic Endometrial Tissue in the Thigh.** *J. A. M. A.* 132: 445, 1946.

The author reports a case of a 35-year-old Filipino woman with a tumor on the posterior aspect of the left thigh. Three years prior to admission she began to suffer from pain and tenderness in a circumscribed area on the posterior aspect of the left thigh during her menses. The mass grew larger and more painful. The tumor mass was removed and on microscopic examination showed the typical structure of an endometrioma.

WILLIAM BERMAN.

### Venereal Disease

**Perkins, George E., and Brewster, Harold N.: Penicillin in the Treatment of Gonorrhea in Women, Results of Treatment as Reported by Twelve Cooperating Venereal-Disease Clinics in Massachusetts During 1945,** *New England J. Med.* 236: 277, 1947.

This study was based on the tabulation of information sent in by twelve cooperating clinics in Massachusetts regarding cases of gonorrhea in women who had been treated with varying courses of intramuscular injections of an aqueous solution of penicillin. Two hundred and thirty-four courses of treatment were given in two hundred cases. The best results were obtained by the use of 150,000 units or more of penicillin divided into three equal doses spaced at two hour intervals.

The authors state that the application of penicillin seems to be the outstanding advance to date in the therapy of gonorrhea. The results so striking that all other forms of therapy now seems antiquated.

JAMES P. MARR.

## ROSTER OF AMERICAN OBSTETRICAL AND GYNECOLOGICAL SOCIETIES\*

(Appears in January, April, July, October)

- American Gynecological Society.** (1876) *President*, Emil Novak, Baltimore, Md. *Secretary*, Norman Miller, Ann Arbor, Mich. Annual meeting to be held at Williamsburg, Va., May 24, 25, and 26, 1948.
- American Association of Obstetricians, Gynecologists and Abdominal Surgeons.** (1888) *President*, A. D. Campbell, Montreal, Quebec. *Secretary*, James R. Bloss, 418 11th Street, Huntington, W. Va. Annual meeting Hot Springs, Va., Sept. 4-6, 1947.
- Central Association of Obstetricians and Gynecologists.** (1929) *President*, Earl C. Sage, Omaha, Neb. *Secretary-Treasurer*, John I. Brewer, 104 South Michigan Ave., Chicago, Ill. Annual meeting Louisville, Ky., Oct. 23, 24, and 25, 1947.
- South Atlantic Association of Obstetricians and Gynecologists.** (1938) *President*, J. Randolph Perdue, Miami, Fla. *Secretary*, E. D. Colvin, 1259 Clifton Road, N.E., Atlanta, Ga. Annual meeting at Augusta, Ga., February 12 to 14, 1948.
- A. M. A. Section on Obstetrics and Gynecology.** *Chairman*, William F. Mengert, Dallas, Texas. *Secretary*, A. B. Hunt, Mayo Clinic, Rochester, Minn. Annual meeting June, 1947.
- New York Obstetrical Society.** (1863) *President*, Albert H. Aldridge. *Secretary*, Claude E. Heaton, 205 East 69th St., New York 21, N. Y. Second Tuesday, from October to May, Yale Club.
- Obstetrical Society of Philadelphia.** (1868) *President*, John B. Montgomery. *Secretary*, James P. Lewis, 1930 Chestnut St., Philadelphia, Pa. First Thursday, from October to May.
- Chicago Gynecological Society.** (1878) *President*, Aaron E. Kanter. *Secretary*, Edward M. Dorr, 30 N. Michigan Ave., Chicago 2, Ill. Third Friday, from October to June, Hotel Knickerbocker.
- Brooklyn Gynecological Society.** (1890) *President*, Alexander E. Dunbar. *Secretary*, William T. Daily, 142 Joralemon St., Brooklyn, N. Y. First Friday, from October to May, Kings County Medical Society, 1313 Bedford Ave., Brooklyn, N. Y.
- Baltimore Obstetrical and Gynecological Society.** (1929) *President*, Lawrence Wharton. *Secretary-Treasurer*, John W. Haws, 9 E. Chase St., Baltimore, Md. Meets quarterly at Maryland Chirurgical Faculty Bldg.
- Cincinnati Obstetrical Society.** (1876) *President*, Carroll J. Fairo. *Secretary*, Joseph G. Crotty, 136 West McMillan St., Cincinnati, Ohio. Third Thursday of each month.
- Louisville Obstetrical and Gynecological Society.** *President*, W. O. Johnson. *Secretary*, W. E. Oldham, 842 Barrett Avenue, Louisville, Ky. Meetings fourth Monday of each month from September to May, Brown Hotel.
- Portland Society of Obstetrics and Gynecology.** *President*, Ronald Frazier. *Secretary-Treasurer*, Gifford D. Seitz, 919 Taylor St. Bldg., Portland 5, Ore. Meetings last Wednesday of each month.
- Pittsburgh Obstetrical and Gynecological Society.** (1934) *President*, Joseph A. Hepp. *Secretary*, Clarence H. Ingram, Jr., 6004 Penn Avenue, Pittsburgh 6, Pa. First Monday of October, November, December, January, February, March, April, and May.
- Obstetrical Society of Boston.** (1861) *President*, Paul Gustafson. *Secretary*, H. Bristol Nelson, 1180 Beacon Street, Brookline, Mass. Third Tuesday, October to April, Harvard Club.
- New England Obstetrical and Gynecological Society.** (1929) *President*, Arthur E. G. Edgelow, Springfield, Mass. *Recorder*, Carmi R. Alden, 270 Commonwealth Ave., Boston 16, Mass. Meetings held in May and December.
- Pacific Coast Obstetrical and Gynecological Society.** (1931) *President*, Henry N. Shaw. *Secretary-Treasurer*, William Benbow Thompson, 6253 Hollywood Blvd., Los Angeles, Calif. Next meeting in Seattle, Wash., Oct. 1 to 4, 1947.
- Washington Gynecological Society.** (1933) *President*, William J. Cusack. *Secretary*, John Parks, 901 23 St., N.W., Washington, D. C. Fourth Saturday, October, November, January, March, May.
- New Orleans Obstetrical and Gynecological Society.** (1924) *President*, Dr. Earl Conway Smith. *Secretary*, John S. Herring, Audubon Bldg., New Orleans 16, La. Meetings held October, November, January, March, and May.
- St. Louis Gynecological Society.** (1924) *President*, Joseph A. Hardy, Jr. *Secretary*, Paul F. Fletcher, 634 North Grand Ave., St. Louis 3, Mo. Meetings second Thursday, October, December, February, and April.

\*Changes, omissions, and corrections should be addressed to the Editor of the JOURNAL. The number after the Society's name is the year of founding.

- San Francisco Gynecological Society.** (1929) *President*, Albert M. Vollmer. *Secretary*, Daniel G. Morton, University of California Hospital, San Francisco, Calif. Regular meetings held second Friday in month from October to April, University Club, San Francisco, or Claremont Country Club, Oakland, Calif.
- Texas Association of Obstetricians and Gynecologists.** (1930) *President*, Warren E. Massey. *Secretary*, George F. Adam, 4115 Fannin St., Houston 4, Tex.
- Michigan Society of Obstetricians and Gynecologists.** (1924). (Formerly the Detroit Obstetrical and Gynecological Society.) *President*, Clarence E. Toshach. *Secretary*, John P. Ottawa, 1551 Woodward Ave., Detroit, Mich. Meetings first Tuesday of each month from October to May (inclusive).
- Central New York Association of Obstetricians and Gynecologists.** (1938) *President*, Raymond J. Pieri. *Secretary*, Nathan N. Cohen, 713 E. Genesse St., Syracuse, N. Y. Meets second Tuesday of September, November, January, March, and May.
- Alabama Association of Obstetricians and Gynecologists.** *President*, Gilbert F. Douglas. *Secretary*, Hunter Brown, 1922 South Tenth Ave., Birmingham, Ala.
- San Antonio Obstetric Society.** *President*, I. T. Cutter. *Secretary*, S. Foster Moore, Jr., San Antonio, Tex. Meetings held first Tuesday of each month at Gunter Hotel.
- Seattle Gynecological Society.** (1941) *President*, Carl M. Helwig. *Secretary*, Roger E. Stewart, Stimson Bldg., Seattle, Wash. Meetings held on third Wednesday of each month.
- Denver Obstetrical and Gynecological Society.** (1942) *Secretary*, Emmett A. Mechler, 1612 Tremont St., Denver, Colo.
- Wisconsin Society of Obstetrics and Gynecology.** (1940) *President*, J. M. Freeman. *Secretary-Treasurer*, Lionel T. Servis, 425 East Wisconsin Ave., Milwaukee. Meetings held in May and October.
- San Diego Gynecological Society.** (1937) *President*, R. C. Hall. *Secretary*, D. Dalton Deeds, 2001 Fourth Ave., San Diego, Calif. Meetings held on the last Wednesday of each month.
- North Dakota Society of Obstetrics and Gynecology.** (1938) *President*, Ralph E. Leigh, Grand Forks. *Secretary*, G. Wilson Hunter, 807 Broadway, Fargo, N. D.
- Virginia Obstetrical and Gynecological Society.** (1936) *President*, John Boyd. *Secretary-Treasurer*, William Durwood Suggs, Monument Ave. and Lombardy St., Richmond, Va. Next meeting not announced.
- Columbus Obstetric and Gynecologic Society.** (1944) *President*, Dana Cox. *Secretary*, Zeph J. R. Hollenbeck, 9 Buttles Ave., Columbus, Ohio. Meetings held fourth Wednesday of each month.
- Naussau Obstetrical Society.** (1944) *President*, Austin B. Johnson. *Secretary*, Robert S. Millen, Westbury, N. Y. Meetings, bimonthly from October to May.
- Bronx Gynecological and Obstetrical Society.** (1924) *President*, H. J. Lesnick. *Secretary*, Mark Daniel, 2344 Davidson Ave., Bronx 53, N. Y. Meetings, fourth Monday monthly from October to May.
- Washington State Obstetrical Society.** (1936) *President*, John H. Fiorino, Everett. *Secretary*, H. H. Skinner, Yakima, Meetings, first Saturday of April and October.
- Kansas City Obstetrical and Gynecological Society.** (1922) *President*, Thomas J. Sims. *Secretary*, LeRoy Goodman, 702 Bryant Bldg., Kansas City, Mo. Meetings, last Thursday, September, November, January, and March; first Thursday, May, University Club.
- Los Angeles Obstetrical and Gynecological Society.** (1914) *President*, Carl E. Krugmeier. *Secretary-Treasurer*, A. M. McCausland, 3780 Wilshire Blvd., Los Angeles, Calif.
- North Carolina Obstetrical and Gynecological Society.** (1932) *President*, Wallace B. Bradford. *Secretary*, Richard B. Dunn. Meetings semiannually.
- The Society of Obstetricians and Gynecologists of Canada.** (1944) *President*, William A. Scott. *Secretary*, James Goodwin, 516 Medical Arts Bldg., Toronto, 5. Meetings held annually, date of next meeting to be announced later.
- Akron Obstetrical and Gynecological Society.** (1946) *President*, S. B. Conger. *Secretary-Treasurer*, Alven M. Weil, 1030 First National Tower, Akron 8, Ohio. Meetings held third Friday of January, April, July, and October, City Club of Akron, Ohio, Bldg.
- Minnesota Society of Obstetrics and Gynecology.** *President*, Everett C. Hartley. *Secretary*, John Haugen, 100 E. Franklin Ave., Minneapolis, Minn. Meetings held spring and fall.
- Miami Obstetrical and Gynecological Society.** (1946) *President*, M. C. Wilson. *Secretary*, George A. Mitchell, Huntington Bldg. Meetings, second Thursday in January, March, May, and November.
- Omaha Obstetrical and Gynecological Society.** (1947) *President*, Charles F. Moon. *Secretary*, Donald C. Vroman, 813 Medical Arts Bldg., Omaha 2, Neb. Meetings held third Wednesday in January, March, May, September, November.
- Oklahoma City Obstetrical and Gynecological Society.** (1940) *President*, Le Roy H. Sadler. *Secretary-Treasurer*, John W. Records, 301 Northwest 12 Street, Oklahoma City.
- Cleveland Obstetrical and Gynecological Society.** (1947) *President*, Robert E. Faulkner. *Secretary*, G. Keith Folger, 10515 Carnegie Ave. Meetings on fourth Tuesday of September, November, January, March, and May at University Club, 3813 Euclid Ave., Cleveland 15, Ohio.

- New Jersey Obstetrical and Gynecological Society.** (1947) *President*, Samuel A. Cosgrove. *Secretary*, Benjamin Daversa, Spring Lake, N. J. Meetings semiannually.
- Honolulu Obstetrical and Gynecological Society.** (1947) *President*, Colin C. McCorriston. *Secretary-Treasurer*, K. S. Tom, 296-E South Vineyard Street, Honolulu 39, Hawaii. Meetings third Monday of each month, Mabel Smyth Building.
- Oregon Society of Obstetricians and Gynecologists.** *President*, Duncan R. Neilson. *Secretary-Treasurer*, David M. Baker, 520 Mayer Bldg., Portland 5, Ore. Meetings held on third Friday of each month from October to May.
- National Federation of Obstetric-Gynecologic Societies.** (1947) *President*, William Benbow Thompson. *Secretary*, Woodward D. Beacham, 1430 Tulane Ave., New Orleans 13, La.

## Items

### Notice to Diplomates

#### American Board of Obstetrics and Gynecology, Inc.

The forthcoming fourth edition of the Directory of Medical Specialists plans to designate by appropriate abbreviations whether Diplomates of the above Board practice both branches of the specialty or major in one or the other. The letters OG will be used to indicate combination of practice in both branches, the letter O that the Diplomate majors in obstetrics, and the letter G that he majors in gynecology.

Diplomates who have not already notified the Directory Publication office on this matter in making their biographic returns should communicate with the Directory of Medical Specialists, 210 East Ohio Street, Chicago, Illinois.

PAUL TITUS, M.D.  
Secretary.

### Committee on Human Reproduction of the National Research Council

The Committee on Human Reproduction of the National Research Council, acting for the National Committee on Maternal Health, Inc., announces that it will entertain applications for grants for research in the field of reproduction. Applications to become effective 1 July 1948 will be received until 1 May 1948; applications to become effective 1 October 1948 will be received until 1 August 1948.

The Committee will consider support of biological, clinical, economic, medical, psychological and sociological research dealing broadly with the field of human reproduction in general and with respect to specific problems including maternal and fetal physiology, the factors controlling conception, the physiology of fertilization and conception, and sterility. For the year 1948-49, the Committee will place specific emphasis upon investigations of the factors controlling conception, fertility, and sterility, but other fields of endeavor will be supported if projects of special significance are presented. In subsequent years, changing emphasis may be anticipated.

The National Committee on Maternal Health has advised the National Research Council that it proposes to solicit funds to finance the program of research recommended by the Committee on Human Reproduction to an amount of approximately \$200,000 for 1948-49.

Communications regarding grants should be addressed to Committee on Human Reproduction, National Research Council, 2101 Constitution Avenue, N.W., Washington 25, D. C.